U.S. Army Corps
of Engineers
St. Paul District

Devils Lake, North Dakota

Social Impact Assessment

February 2002

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Executive Summary

Devils Lake, located in eastern North Dakota, lies in a closed subbasin of the Red River of the North. Runoff from the 3,814-square-mile watershed flows into the lake, carrying salts and other dissolved solids. There is no drainage from the lake, and evaporation provides the only outflow, accumulating salts in Devils Lake in a manner similar to Great Salt Lake.

The lake level varies from year to year, depending on the balance between inflow from the watershed and outflow via evaporation. Since 1993, a wet climatic cycle has caused Devils Lake to rise almost 27 feet, from 1,421 feet above mean sea level (asl) to approximately 1,448 asl. The volume of water in the lake has quadrupled, and the area of the lake has expanded from 70 square miles to over 200 square miles. The rising lake has inundated homes, roads, farmlands, utilities, and railways.

In response to rising lake levels, homes around the lake have been abandoned or moved, roads have been raised, and dikes have been built. The Federal government has responded to the crisis with nearly one billion dollars in disaster loans, housing aid, crisis counseling, flood protection, and transportation and infrastructure improvements. If the lake continues to rise, additional expenditures will be needed to protect homes, property, and infrastructure. If Devils Lake rises 11 feet from its current elevation (1,448 asl) to 1,459 asl, the lake would overflow southward into the Sheyenne River. It is estimated that an additional $500 million in potential damages would occur around Devils Lake if lake levels continue to rise to the overflow elevation and if no additional action is taken. Since the Sheyenne River is a tributary to the Red River, both rivers could be adversely affected by a Devils Lake overflow via flooding and salinity effects. Adverse effects could extend down the Red River and across the Canadian border.

In response to past flooding at Devils Lake and the prospect of additional lake level rise, the U.S. Congress authorized the U.S. Army Corps of Engineers (Corps) to design an emergency outlet to release water from Devils Lake and prepare an Environmental Impact Statement (EIS) in compliance with the National Environmental Policy Act of 1972 (NEPA), as amended. This investigation represents the social impact assessment for the EIS and contributes to the documentation of potential effects of alternative plans to address flooding problems at Devils Lake. It evaluates social and local economic effects that are anticipated to result from implementation of the alternative plans, including: a constrained Pelican Lake outlet, enhanced upper basin storage, and expanded infrastructure measures.

The Pelican Lake constrained outlet is the most feasible of the outlet alternatives. This alternative would capture water from Pelican Lake before it enters Devils Lake and convey this water via pipeline to a discharge point 22 miles to the south on the Sheyenne River. Due to the salinity pattern in Devils Lake, the Pelican Lake outlet would allow discharge of the freshest water available in Devils Lake to the Sheyenne River and the Red River. The constrained Pelican Lake outlet was designed to operate at less than full capacity in order to meet water quality and channel capacity limits at the discharge point on the Sheyenne River.

The upper basin storage alternative would use drained depressions in the watershed to retain runoff and thereby reduce inflow into Devils Lake. Hydraulic studies indicate that increased upper basin storage would have limited effects on lake levels.

The expanded infrastructure measures alternative primarily addresses problems associated with roads currently serving as levees. As part of this alternative, new levees would be constructed on the landward side of the roads, where possible, and culverts would be placed through the road embankments, allowing hydraulic pressure to equalize on both sides. As a result, the area between the road embankment and the new line of protection would be inundated.

These alternatives have been compared with two without-project conditions: Overflow and No Overflow. The Overflow condition corresponds to the wet future climatic scenario, which would consist of a continuation of the recent wet cycle until overflow elevation was achieved. The "with-project" and "without-project" conditions have been compared for a 50-year period of analysis (2000-2050). The following criteria were used to evaluate the social and local economic effects of the alternative plans relative to the two without-project conditions.

Social Effects	**Local Economic Effects**
Population Relocation	Environmental Justice – Economic Aspects
Environmental Justice – Social Aspects	Transportation
Public Health	Agriculture
Public Safety	Energy Resources/Use
Noise levels	Employment
Aesthetic Values	Regional Growth
Recreation	Business Activity
Community Growth/Development	Property Values
Community Cohesion	Fiscal Effects
Land Use	Public Facilities/Services
Controversy	

The social and local economic effects of the alternative plans are secondary effects that are based upon anticipated physical conditions associated with each plan. The effects of each plan are based upon comparison of the with- and without-project conditions. In the case of Devils Lake, the without-project conditions could involve significant adverse social and local economic effects, as suggested by recent experience with the rising lake. It is the difference of effects between the with- and without-project conditions (i.e., the relative – not absolute – effects of the alternatives) that are relevant to decision making regarding Devils Lake.

The Corps has conducted stochastic and scenario modeling of alternative future conditions in the Devils Lake study area as part of the Devils Lake planning process. The principal physical effects that were used to assess social and local economic effects include:

- Devils Lake levels and inundated areas,
- Potential natural overflow to the Sheyenne River,

- Water quality effects of outlet releases downstream along the Sheyenne River and Red River,
- Water quantity effects of outlet releases downstream, including flooding and other effects,
- Water quality effects of outlet releases on Devils Lake,
- Physical features of alternative plans, and
- Construction activities.

The comparisons of with- and without-project conditions are summarized in a series of evaluation matrices. The matrices suggest that with respect to social and local economic criteria the Pelican Lake outlet is preferable to enhanced upper basin storage and to expanded infrastructure under the Overflow and No Overflow without-project conditions. The principal advantage of this alternative is its ability to inhibit further rise of Devils Lake and, in the case of the Overflow condition, prevent an uncontrolled overflow event. The Pelican Lake outlet would significantly inhibit additional lake level rise while minimizing downstream effects on the Sheyenne River and Red River through constrained operational parameters.

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INTRODUCTION

Devils Lake, located in eastern North Dakota, lies in a closed subbasin of the Red River of the North (Red River). Runoff from the 3,814-square-mile watershed flows into the lake. There is no drainage from the lake, and evaporation provides the only outflow. The lake level varies from year to year, depending on the balance between inflow from the watershed and outflow via evaporation. As in the case of the Great Salt Lake in Utah, evaporation has accumulated salts and other dissolved solids in Devils Lake, which were transported in solution by runoff from the watershed.

Since 1993, precipitation in eastern North Dakota has been unusually heavy, averaging over 22 inches per year. This represents a 24 percent increase over the 1950-1992 average of 17.5 inches per year. The wet climatic conditions have been accompanied by a 40 percent reduction in average evaporation. The wet "cycle" has caused Devils Lake to rise almost 27 feet since 1993, from 1,421 feet above mean sea level (asl) to 1,448 asl. The volume of water in the lake has quadrupled, and the area of the lake has expanded from 70 square miles to over 200 square miles. The rising lake has inundated homes, roads, farmlands, utilities, and railways. In some areas, the shoreline has expanded 10 miles landward. Devils Lake is now higher than at any time since the 1830's, prior to settlement of the area.

In response to rising lake levels, homes around the lake have been abandoned or moved, roads have been raised, and dikes have been built. Since 1993, approximately 400 homes have been moved along with 200 other buildings. The Federal government has aided the retreat from the rising waters with approximately $625 million in disaster loans, housing aid, and crisis counseling. In addition, more than $300 million in Federal emergency response funding has been spent on transportation infrastructure, including road and railroad raisings and bridge replacements. Approximately 7.2 miles of levees have been constructed on the north side of the lake to protect the City of Devils Lake. Finally, significant expenditures have been made to protect water and sewer infrastructure around the lake.

In June 2001, Devils Lake reached elevation 1,446 asl, allowing it to overflow eastward through Jerusalem Coulee into Stump Lake. If the lake continues to rise, additional expenditures would be needed to protect homes, property, and infrastructure. If Devils Lake rises 11 feet from its current elevation (1,448 asl) to 1,459 asl, the lake would overflow from Stump Lake through a natural outlet (Tolna Coulee) southward into the Sheyenne River. It is estimated that an additional $500 million in potential damages would occur around Devils Lake if lake levels continue to rise to the overflow elevation. Under such circumstances, the greatest impacts would be to the City of Devils Lake and to the highways around the lake. Since the Sheyenne River is a tributary to the Red River, both rivers could be adversely affected by a Devils Lake overflow. The overflow could exacerbate flooding problems along both waterways, and the high salinity of Devils Lake water could threaten fish and wildlife resources and adversely affect municipal, industrial, and agricultural water users. These adverse effects could extend down the Red River

as it flows over 400 miles from its confluence with the Sheyenne River at Fargo, North Dakota, across the Canadian border and into Lake Winnipeg in the Province of Manitoba, Canada.

In response to past flooding at Devils Lake and the prospect of additional lake level rise, the U.S. Congress authorized the U.S. Army Corps of Engineers (Corps) to design an emergency outlet to release water from Devils Lake and prepare an Environmental Impact Statement (EIS) in compliance with the National Environmental Policy Act of 1972 (NEPA), as amended. This investigation represents the social impact assessment for the EIS and contributes to the documentation of potential effects of alternative plans to address flooding problems at Devils Lake. This document develops a social and institutional profile of existing conditions at Devils Lake. It also evaluates social and local economic effects that are anticipated to result from implementation of the alternative plans to address flooding problems at Devils Lake.

The alternative plans have been designed to reduce flood damages related to rising levels of Devils Lake and to reduce the potential for a natural overflow event into the Sheyenne River and the Red River. As part of the EIS, this document supports the planning process to identify feasible solutions for Devils Lake and avoid adverse effects of plan implementation, minimize those effects that are unavoidable, and mitigate unavoidable effects to the extent possible.

SCOPE OF THIS INVESTIGATION

This social impact assessment has been prepared consistent with Federal water resources policies and practices, including the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (P&G, 1983), the Corps *Planning Guidance Notebook* (ER-1105-2-100), and *Procedures for Implementing NEPA* (ER 200-2-2). It includes a socioeconomic profile of the study area and an evaluation of social and localized economic effects of the alternative plans. It also identifies the public and private institutions that are stakeholders in Devils Lake problems and potential solutions and describes their authorities and concerns.

Expected changes associated with the alternative plans have been assessed by comparing anticipated future conditions with implementation of the alternatives against conditions expected to occur without implementation. The "with-project" and "without-project" conditions have been compared for a 50-year period of analysis (2000-2050). As discussed below, there are multiple with- and without-project future conditions that have been evaluated in this investigation.

As part of the Devils Lake planning process, the anticipated effects of the alternative plans on National Economic Development (NED) have been documented. Contributions (or reductions) to NED are changes in the net value of the national output of goods and services that would directly occur in the planning area and in the Nation. The Federal perspective of the NED analysis does not necessarily encompass the community and local economic effects of the alternative plans. This social impact assessment, as part of the NEPA documentation, evaluates issues related to Regional Economic Development (RED) and Other Social Effects (OSE). The local and regional perspective of this investigation includes community and local economic effects of the alternative plans, such as:

- Unemployed and underemployed labor,
- Urban and community impacts, such as employment, population and income distribution,
- Life, health and safety factors,
- Displacement of populations,
- Long-term productivity of resources,
- Energy requirements and conservation,
- Educational, cultural or recreational opportunities, and
- Emergency preparedness.

This investigation draws heavily upon technical studies conducted as part of the Devils Lake planning process, including the NED analysis. The technical studies anticipate the physical effects of the alternative plans (e.g., changes in lake levels). The social and local economic effects of the alternative plans can only be anticipated by interpreting the implications of these physical changes.

It is inevitable that there is some overlap between the NED analysis in the planning report and the RED/OSE analysis in this social and local economic impact assessment, especially since NED effects often have secondary and indirect consequences on RED & OSE factors. Duplication of the NED analysis has been minimized in this document to the extent possible. In some cases, readers of this document are referred to the planning report for more information.

METHODOLOGY AND ORGANIZATION OF THIS DOCUMENT

The organization of this document is illustrated in Figure 1. The methodology employed is a four-part process. First, with- and without-project conditions are profiled. Second, the potential physical effects of the alternative plans are explored. Third, the social and local economic implications of the physical effects are examined drawing upon a socioeconomic profile of the study area and an array of evaluation criteria. The final section fulfills the overall intent of the document by summarizing and comparing social and local economic impacts of the alternative plans.

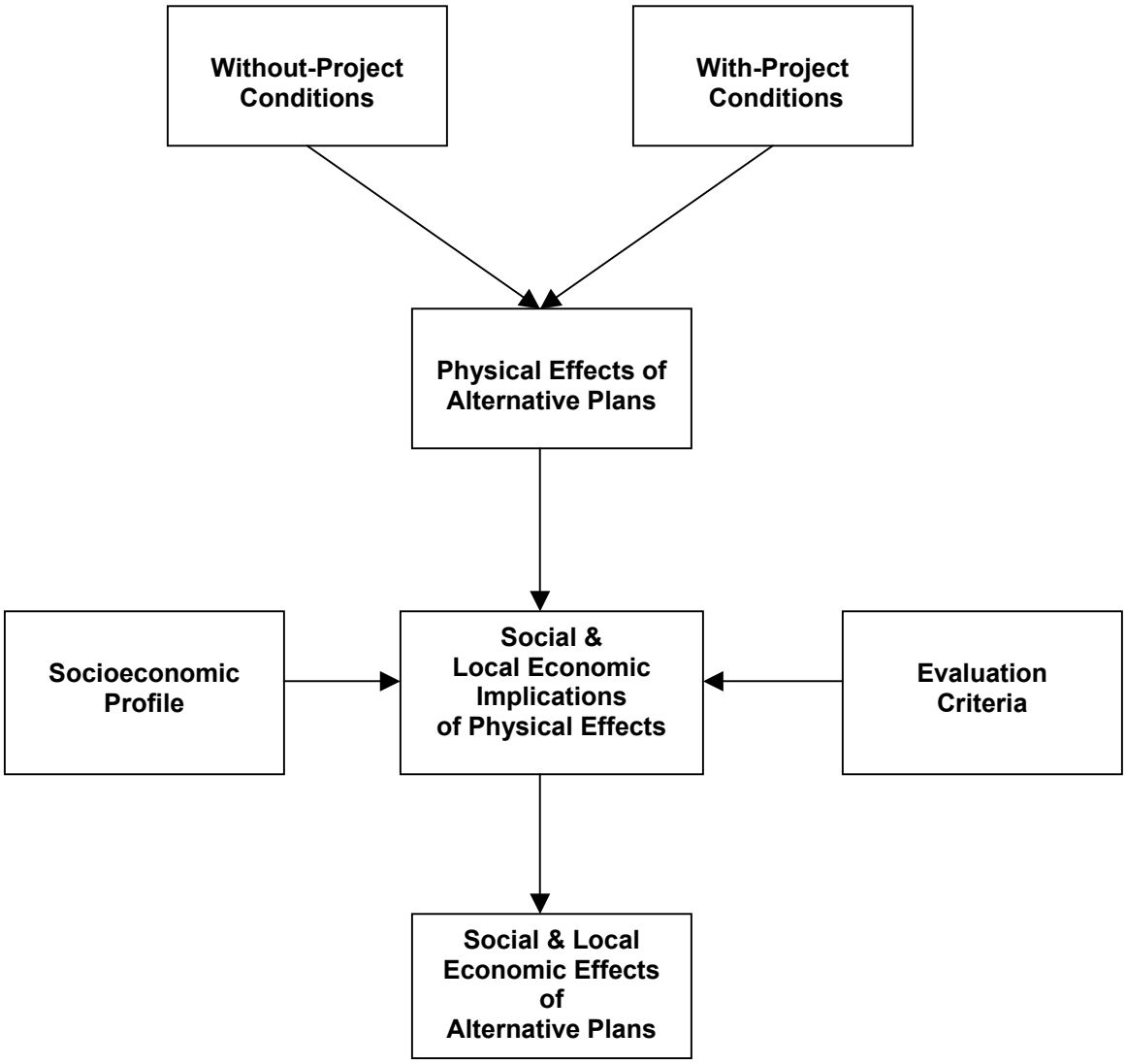

Figure 1
Methodology / Organization of This Document

STUDY AREA

The study area for this investigation encompasses Devils Lake and its watershed, as well as areas that are potentially downstream (from an outlet or overflow) along the Sheyenne River and along the Red River. Figure 2 illustrates the location and extent of the study area, including the Devils Lake watershed, the lake, and potential downstream areas. Figure 3 provides greater detail on the areas around the lake, including the City of Devils Lake on the north side, the City of Minnewaukan on the west side, and the Fort Totten Indian Reservation on the south side. Figure 4 provides additional detail for areas downstream along the Sheyenne River and the Red River, including Lake Ashtabula, Valley City, and the cities of Fargo and Grand Forks. In this investigation, the anticipated effects of the alternative plans on the lake, areas around the lake, the watershed, and downstream areas will be discussed in detail.

WITHOUT-PROJECT CONDITIONS

One of the principal challenges in developing solutions for Devils Lake is the significant level of uncertainty regarding future lake levels. Two different without-project conditions have been evaluated in this investigation, differentiated by whether or not Devils Lake would reach a level sufficient to overflow naturally to the Sheyenne River. The No Overflow future condition assumes that Devils Lake may continue to rise, but not sufficiently to result in an overflow. Under this condition, the Sheyenne River would continue to be disconnected from Devils Lake. This condition is consistent with the probability-based (stochastic) approach used in the hydrologic and hydraulic analyses conducted as part of the Devils Lake planning process. These analyses estimate the probability of a natural overflow event during the next 50 years as less than 10 percent.

The Overflow future condition corresponds to the "Wet Future" climate scenario that is being evaluated in the Devils Lake planning process. This scenario is based on a continuation of wet climatic conditions that have resulted in the 27-foot lake rise since the early 1990's. Specifically, the Wet Future climate scenario repeats the climatic and hydrologic conditions for the seven highest inflow years in recent history (1993-1999) for three more seven year cycles, with the remaining 29 years of the 50-year period of analysis having climatic and hydrologic conditions similar to the 1980-1999 period. Under this climate scenario, the lake would continue to rise resulting in an overflow to the Sheyenne River in year 2018.

The Overflow and No Overflow without-project conditions share the following assumptions about conditions around Devils Lake. First, it is assumed that the types of emergency measures that have been implemented around Devils Lake would continue as necessary if the lake continues to rise. For instance, it is assumed that houses would be relocated away from rising lake water as in the past, and the levee system protecting the City of Devils Lake would be augmented as needed to protect the city from lake level rise. Second, it is assumed that the current level of upper basin storage as a measure to reduce inflows would continue to be available. Third, it is assumed that the natural outlet from Stump Lake through Tolna Coulee to the Sheyenne River would be armored to control erosion in the event of a lake overflow.

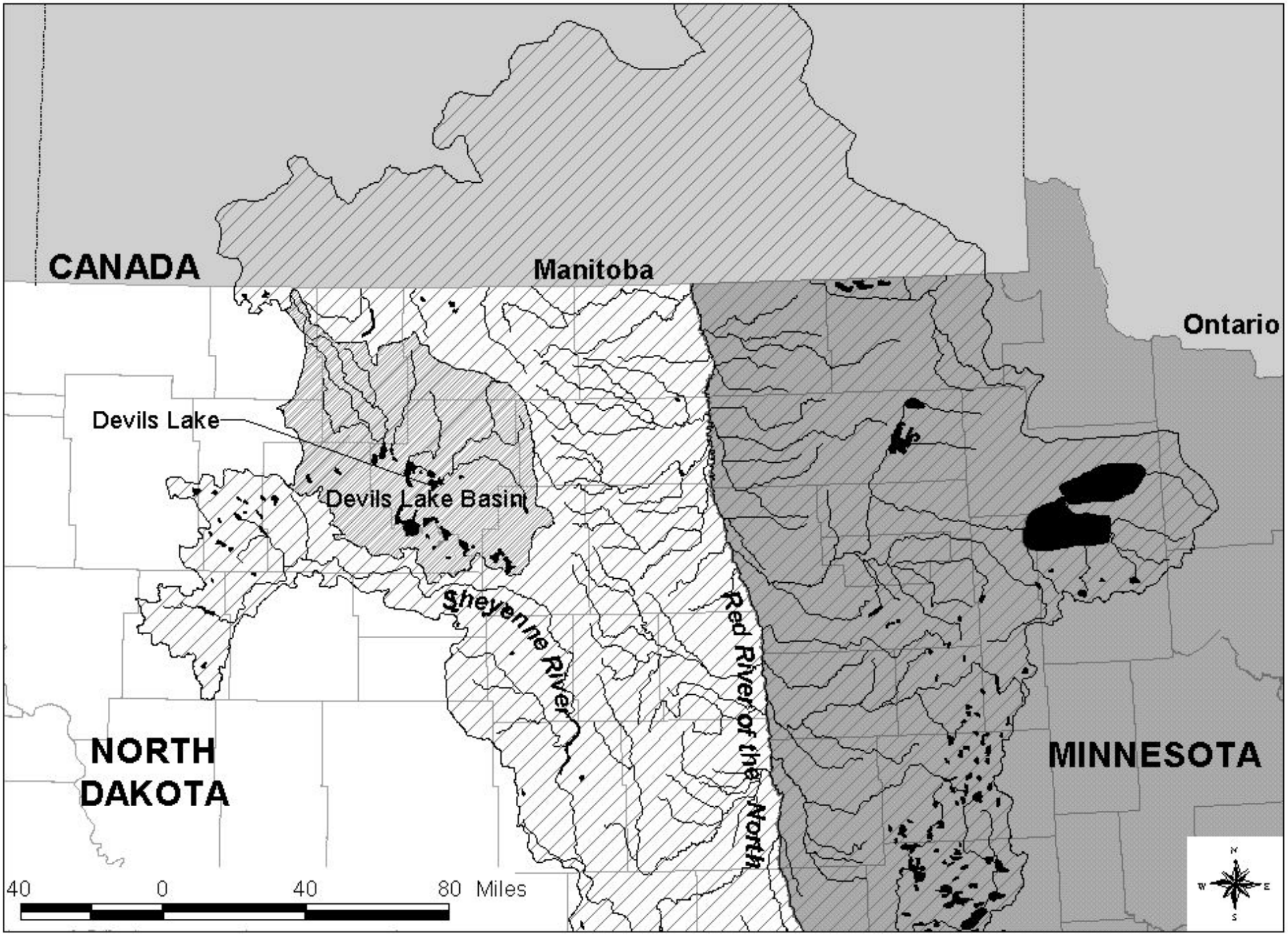

Figure 2. Red River of the North and Devils Lake Basins

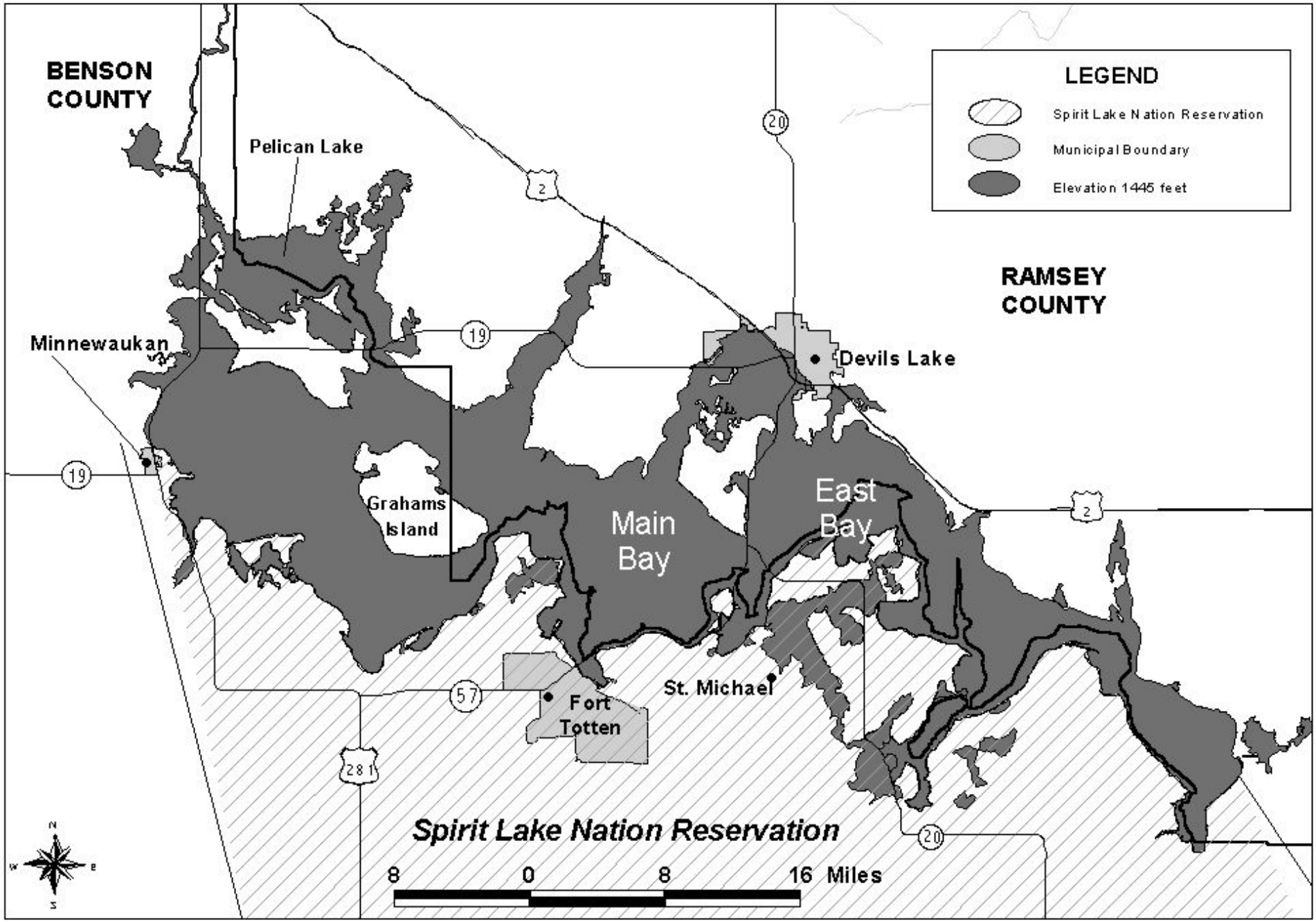

Figure 3. Devils Lake and Surrounding Area

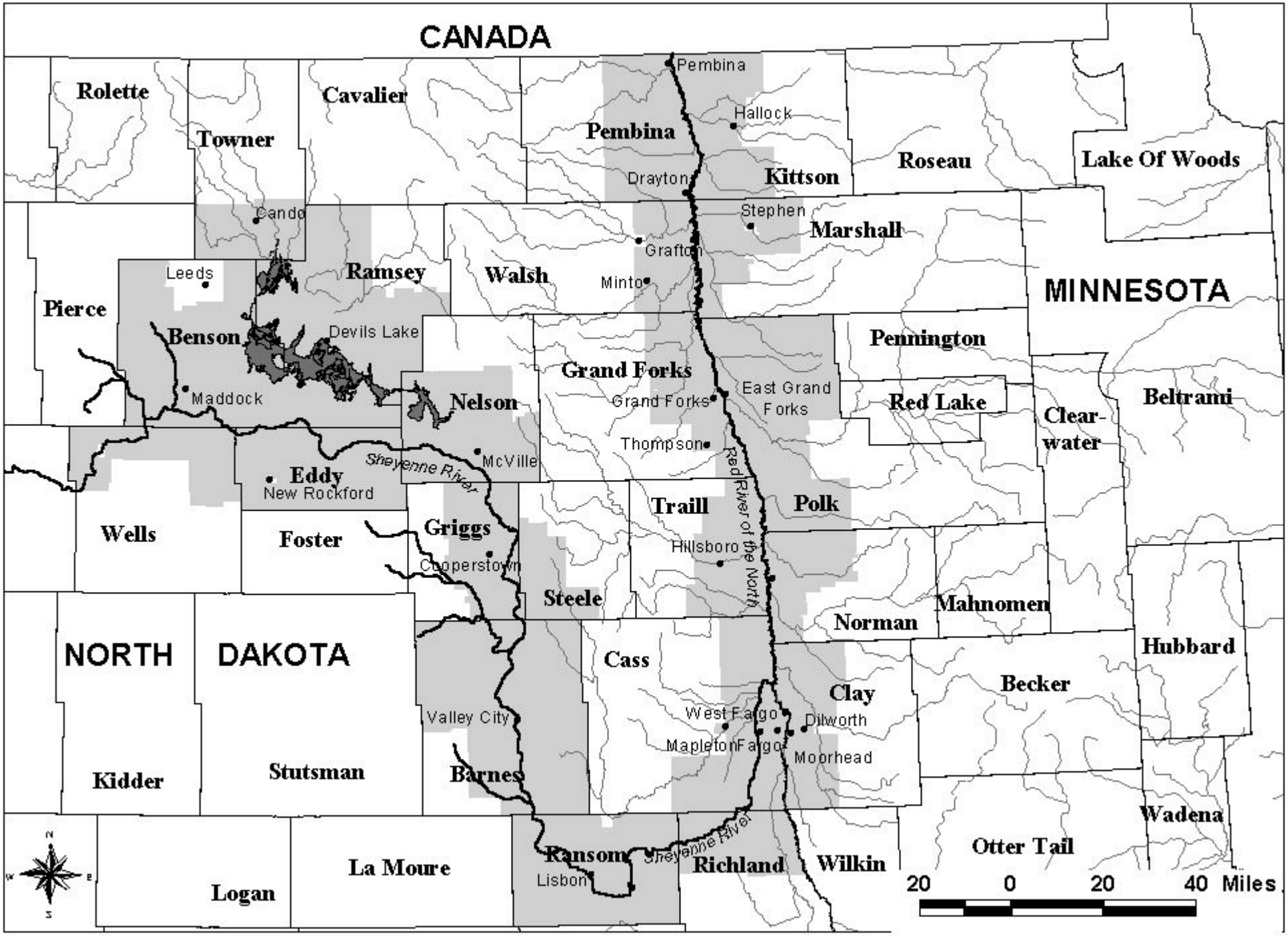

Figure 4. Downstream Detail

Both without-project conditions also have the same assumption about roads that are currently serving as levees around portions of Devils Lake. Due to relatively shallow lake levels prior to 1993, roads across Devils Lake have historically been constructed by placing asphalt atop dirt and stone fill. As the lake has risen in recent years, roads around the lake have been raised to maintain transportation access. At some locations, the raised road embankments are currently serving as levees, protecting property from inundation by the lake. This is problematic, since these roads were not designed or constructed to function as levees. Consequently, road users and residents that are currently protected by these roads may be at risk from catastrophic failure of the road embankments. The total length of roads currently acting as levees around the lake is approximately eight miles. The Federal Highway Administration (FWHA) will no longer allow the use of Federal highway funds for any future work on those highway segments that are serving as levees unless their safety can be certified by the Corps, which is the Federal agency responsible for dam safety. However, the Corps maintains that the road embankments cannot be certified to serve as levees without major structural modifications. Consequently, as part of the without-project condition it is assumed that if the lake continues to rise, the roads would be raised, but they could no longer serve as levees. The lake would be allowed to flow through culverts under the raised roads and those lands that are currently protected by the roads would be inundated.

Given recent history surrounding proposed actions in response to rising lake levels, the without-project conditions are also notable for what they do not include. Specifically, neither without-project condition includes:

(1) Actions currently proposed by the State of North Dakota to construct a temporary outlet from the West Bay of Devils Lake to the Sheyenne River. Since the State's plans for a temporary outlet are not finalized, the Devils Lake planning process includes outlet(s) among alternative plans.

(2) A previously-proposed temporary outlet to the Sheyenne River along the Twin Lakes route through the Fort Totten Indian Reservation. This outlet alternative was screened out early in the Devils Lake planning process due to potential adverse effects on the reservation.

(3) Construction of a channel through Jerusalem Coulee to speed discharge from Devils Lake to Stump Lake. A Jerusalem Coulee channel would not provide a long-term solution to flooding problems on Devils Lake.

WITH-PROJECT CONDITIONS – ALTERNATIVE PLANS

Three alternative plans are being evaluated in the Devils Lake Environmental Impact Statement: a constrained Pelican Lake outlet, enhanced upper basin storage, and expanded infrastructure. The alternative plans are summarized below.

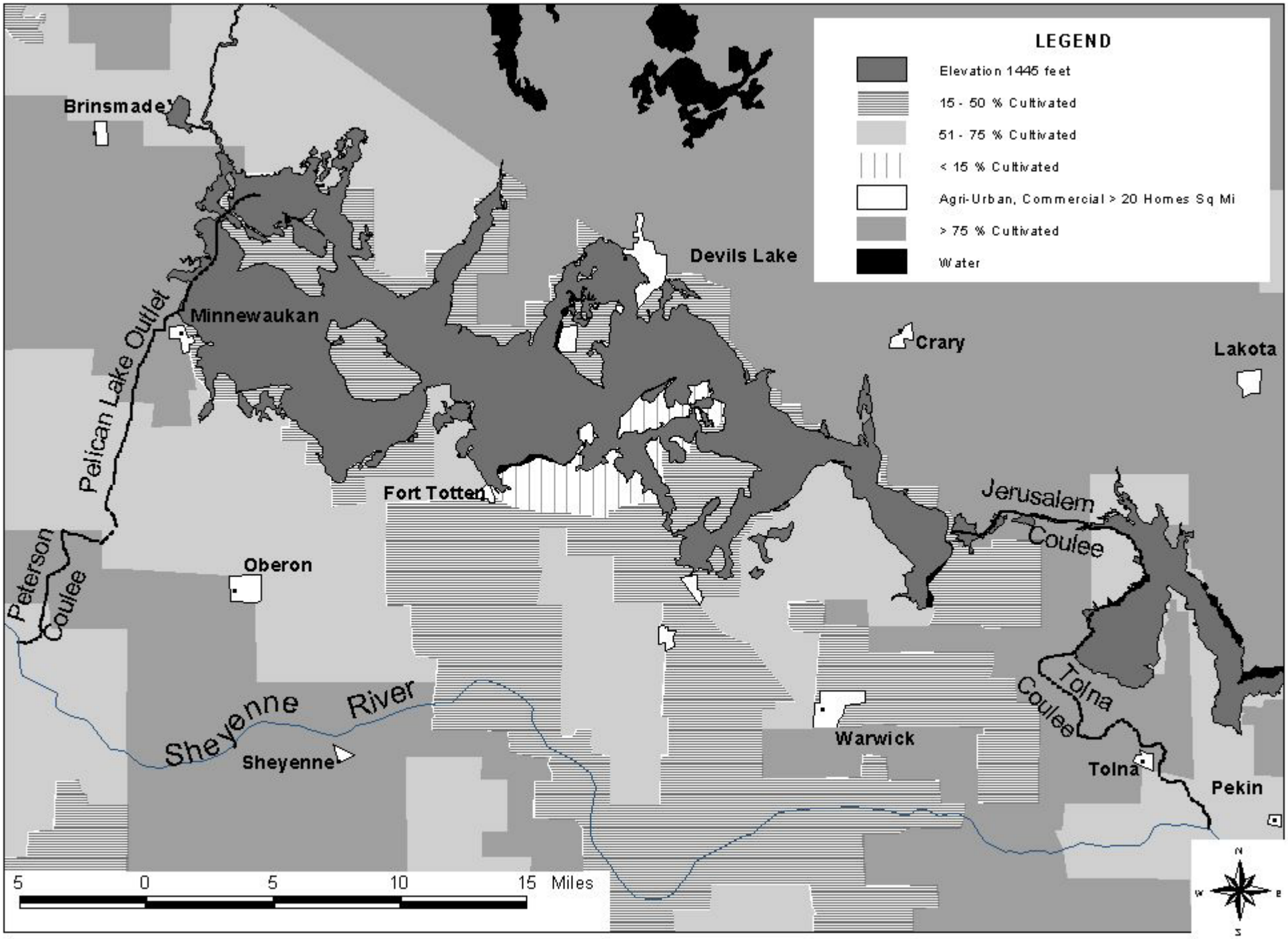

Figure 5. Cropland in the Devils Lake Area

Constrained Pelican Lake Outlet

Based on a screening of alternative outlet plans, the Pelican Lake constrained outlet is the most feasible of the outlet alternatives. This plan, which is the outlet alternative supported by the non-Federal project partner (the State of North Dakota), would be designed and operated to meet water quality standards and avoid flooding effects downstream along the Sheyenne and Red rivers and.

The impetus for an outlet from western end of Devils Lake, rather than the shorter route through the Tolna Coulee is based on the salinity patterns in Devils Lake. Devils Lake is actually a chain of lakes that are connected or disconnected, depending on the lake level. Due to the topography of the Devils Lake watershed, most of the inflow to the lake comes from north of the West Bay. The influx of fresh water from the north and west results in an increasing gradient of salinity from west to east through the now-connected chain of lakes (i.e., bays). Pelican Lake, which is north of the West Bay (see Figure 3), receives fresh water from the watershed via Big Coulee before it enters Devils Lake. Consequently, water quality in Pelican Lake is much less saline than the rest of Devils Lake, particularly following precipitation events.

An outlet from Pelican Lake through Peterson Coulee to the Sheyenne River would extend approximately 22 miles (see Figure 5). It would allow discharge of the freshest water available in Devils Lake to the Sheyenne River and the Red River. As part of this alternative, water would be conveyed via a 6-mile long open channel to a high-head pump station on the north side of Minnewaukan. Water would be pumped through an underground pipeline approximately 16 miles out of the Devils Lake basin to the Sheyenne River. The Pelican Lake outlet is also expected to include a restored hydrologic connection of Dry Lake to Big Coulee (diverting some of the water passing through Channel A) and embankments along Highway 19 to keep the fresher water separated from the more saline West Bay of Devils Lake.

The constrained-flow Pelican Lake outlet would have a maximum capacity of 300 cubic feet per second (cfs). It would be designed to operate at less than full capacity in order to meet water quality and channel capacity limits at the discharge point on the Sheyenne River. The State of North Dakota's sulfate standard for the Sheyenne River is 450 milligrams per liter (mg/L), and the bankfull channel capacity of the Sheyenne River at this location is 600 cfs. In order to stay within these limits, the pumping system would need to be capable of operating efficiently at variable discharge levels.

Upper Basin Storage

The upper basin storage alternative would use drained depressions in the watershed to retain runoff and thereby reduce inflow into Devils Lake. Investigation of the storage potential of the upper basin identified approximately 294,400 acres of depressions, of which 92,400 acres are anticipated to have storage potential. In order to use drained depressions for storage, easements would be required and fill could then be placed across their outlets to impound water. It is assumed that 50 percent of the volume of the drained depressions could be used for storage purposes.

Hydraulic studies indicate that increased upper basin storage would have a limited impact on lake levels. Consequently, this alternative is generally regarded as a component of a comprehensive plan to address flooding problems at Devils Lake, rather than as a viable stand-alone project.

Expanded Infrastructure Measures

The expanded infrastructure measures alternative primarily addresses problems associated with roads currently serving as levees. As part of this alternative, new levees would be constructed on the landward side of the roads, where possible, and culverts would be placed through the road embankments, allowing hydraulic pressure to equalize on both sides. As a result, the area between the road embankment and the new line of protection would be inundated.

SOCIOECONOMIC PROFILE OF THE STUDY AREA

The Devils Lake study area is predominately rural with a low population density and an economy that is based on agriculture. However, in the study area there are also (1) a variety of small cities, such as the City of Devils Lake, that serve as retail and service centers for surrounding counties and (2) large, regional urban centers such as the Fargo and Grand Forks metropolitan areas.

A socioeconomic profile of the study area is presented below. It includes population, income, employment, economy, transportation, and land use. These topics are addressed for areas potentially affected by the alternative plans, including: the upper basin, areas around the lake, areas downstream along the Sheyenne River and areas along the Red River in North Dakota and in Minnesota.

Population

Table 1 contains 1980, 1990, and 2000 population estimates for counties in the Devils Lake study area. The counties are grouped by zone of potential impacts associated with the alternative plans. As indicated in this table, the counties in the Devils Lake area (including the lake area and upper basin counties) have been experiencing population declines in the last 20 years. Table 1 highlights a widespread concern about demographic changes in rural North Dakota, specifically that rural areas are experiencing population declines while regional urban centers, such as Fargo (in Cass County), are growing rapidly. Between 1980 and 2000, population within the lakeside counties and upper basin declined from 36,931 to 33,209 persons, a 10 percent reduction. Ramsey and Benson Counties had the lowest net out-migrations with 12.3 percent and 7.5 percent reductions in population over the 1980-2000 period, respectively. Population decline in rural areas of North Dakota is a complex social and economic phenomenon. One factor that contributes to the migration to urban areas is the depressed agricultural economy. As will be evident later in this document, low commodity prices, particularly for wheat and beef cattle, and high costs of inputs continue to pressure the farm economy of the study area. Another factor is continuing improvements in farm productivity with reduced labor inputs.

Table 1
County Population (1980-2050)
Devils Lake Study Area

Impact Zone	County	1980	1990	2000	1980 – 2000 change (%)	2010*	2020*	2030*	2040*	2050*
Upper Basin	Towner	4,052	3,627	2,876	-29.0%	2,511	2,193	1,915	1,672	1,460
	Cavalier	7,636	6,064	4,831	-36.7%	4,078	3,442	2,906	2,453	2,070
	subtotal	13,668	11,681	9,707	-29.0%	6,589	7,655	6,851	6,165	5,580
Lake Area	Benson	7,944	7,198	6,964	-12.3%	6,562	6,184	5,827	5,491	5,175
	Ramsey	13,048	12,681	12,066	-7.5%	11,887	11,710	11,536	11,364	11,195
	Nelson	5,233	4,410	3,715	-29.0%	3,275	2,886	2,544	2,242	1,977
	subtotal	26,225	24,289	22,745	-13.3%	21,724	20,780	19,907	19,097	18,347
Downstream, ND	Eddy	3,554	2,951	2,757	-22.4%	2,748	2,739	2,731	2,722	2,713
	Griggs	3,714	3,303	2,754	-25.8%	2,411	2,111	1,849	1,619	1,418
	Steele	3,106	2,420	2,258	-27.3%	2,160	2,067	1,978	1,892	1,810
	Barnes	13,960	12,545	11,775	-15.7%	10,822	9,946	9,141	8,402	7,722
	Ransom	6,698	5,921	5,890	-12.1%	5,774	5,661	5,550	5,441	5,335
	Richland	19,207	18,148	17,998	-6.3%	18,507	19,031	19,570	20,124	20,693
	Cass	88,247	102,874	123,138	39.5%	132,542	142,665	153,561	165,289	177,913
	Traill	9,624	8,752	8,477	-11.9%	8,588	8,701	8,815	8,931	9,048
	Grand Forks	66,100	70,683	66,109	0.0%	64,064	62,082	60,162	58,301	56,498
	Walsh	15,371	13,840	12,389	-19.4%	12,088	11,794	11,508	11,228	10,956
	Pembina	10,399	9,238	8,585	-17.4%	8,084	7,612	7,168	6,750	6,356
	subtotal	239,980	250,675	262,130	9.2%	265,043	271,672	279,302	287,977	297,747
Downstream, MN	Clay	49,327	50,422	51,229	2.2%	52,268	53,328	54,409	55,513	56,638
	Norman	9,379	7,975	7,442	-15.0%	6,957	6,503	6,079	5,683	5,313
	Polk	34,844	32,498	31,369	-6.7%	30,455	29,568	28,707	27,870	27,058
	Marshall	13,027	10,993	10,155	-15.6%	9,535	8,953	8,406	7,893	7,411
	Kittson	6,672	5,767	5,285	-13.6%	4,931	4,601	4,293	4,006	3,738
	subtotal	113,249	107,655	105,480	-6.9%	104,146	102,953	101,894	100,965	100,158
Total		291,628	291,787	304,502	4.36%	307,423	315,608	323,032	331,716	341,689

Source: U.S. Bureau of the Census. 2000.

***** Based on Series I projection rates obtained from the North Dakota State Data Center, October 2001 and on data obtained from the Minnesota State Demographic Center, Minnesota Planning, dated June 1998.

The North Dakota State Date Center has forecasted county population for much of the study area through 2015. The Center's projected growth rates to 2015 were extrapolated through the period of analysis to 2050, as shown in Table 1. The forecasts indicate a continued decline with loss of 30-percent of the population between 2000 and 2050. However, there is significant uncertainty in this forecast. An upturn in the farm economy may slow migration from rural areas to urban centers.

Table 2 contains 1990 and 2000 population for municipalities in the study area. This table provides more insight into the urbanization of the study area population. The City of Devils Lake, which is the population and economic center of the lake area, experienced a 7.2 percent population decline from 1990 to 2000, falling from 7,782 to 7,222. Other municipalities around the lake, such as the City of Minnewaukan, had even larger population declines. In contrast, the populations of the City of Fargo and the City of West Fargo have increased over 20 percent in the 1990-2000 period. The City of Grand Forks has not had a similar population boom, perhaps due to recent problems with flooding and fire in the downtown area.

Most of the area surrounding Devils Lake is rural with low population densities (see Table 3). Of the upper basin and lake area counties, Towner County has the lowest population density with 3 persons per square mile, and Ramsey County, which includes the City of Devils Lake, has the highest density with 9 persons per square mile. Most of the counties downstream of Devils Lake along the Sheyenne River and Red River are also rural with low population densities. Population concentrations in the City of Fargo (Cass County), City of Moorhead (Clay County, MN), and the City of Grand Forks (Grand Forks County) explain their high county population densities.

The composition of the study area population, including age and racial characteristics, and its income characteristics will be examined in detail as part of the environmental justice analysis, presented in subsequent sections of this document.

Income

Table 4 contains county-level income data from 1993 and 1997, developed as part of Current Population Surveys. Census 2000 income information for the study area has not yet been released. Median household incomes in the study area, including the upper basin, lake area, and counties immediately downstream of Devils Lake, increased at a rate well below both state and national averages between 1993 and 1997. Again, the depressed condition of the agricultural economy of North Dakota is the most likely explanation. Nelson County, located just downstream of Devils Lake, had the lowest rate of household income increase with a change of just 5 percent ($1,220), from $24,611 in 1993 to $25,831 in 1997. Benson County, including the Fort Totten Indian Reservation, has the lowest median household income in the study area ($21,833). The incomes of study area residents will be examined in more detail later in this document as part of the environmental justice analysis.

Table 2
Municipal Population (1990, 2000)
Devils Lake Study Area

County, State	City	1990	2000	% change 1990 - 2000
Benson County, ND	Fort Totten	1,359	952	-29.9%
	Leeds	542	83	-84.7%
	Maddock	559	498	-10.9%
	Minnewaukan	401	318	-20.7%
Ramsey County, ND	Devils Lake	7,782	7,222	-7.2%
	Starkweather	197	157	-20.3%
Cavalier County, ND	Langdon	2,241	2,101	-6.2%
	Munich	310	268	-13.5%
Eddy County, ND	New Rockford	1,604	1,463	-8.8%
Nelson County, ND	Lakota	898	781	-13.0%
Towner County, ND	Cando	1,564	1,342	-14.2%
Steele County, ND	Luverne	41	44	7.3%
Barnes County, ND	Valley City	7,163	6,826	-4.7%
	Kathryn	72	63	-12.5%
Ransom County, ND	Fort Ransom	111	70	-36.9%
	Lisbon	2,177	2,292	5.3%
Cass County, ND	City of Fargo	74,111	90,599	22.2%
	City of West Fargo	12,287	14,940	21.6%
Grand Forks County, ND	City of Grand Forks	49,425	49,321	-0.2%
Clay County, MN	City of Moorhead	32,295	32,177	-0.4%

Source: U.S. Bureau of the Census. 2000.

Table 3
County Population Density (2000)
Devils Lake Study Area

Impact Zone	County	Area (square miles)	2000 Population	Pop. Density (persons/sq. mi.)
Upper Basin	Towner	1,041.57	2,876	2.8
	Cavalier	1,510.17	4,831	3.2
	all	2,551.74	9,707	3.8
Lake Area	Benson	1,439.28	6,964	4.8
	Ramsey	1,300.88	12,066	9.3
	Nelson	1,008.74	3,715	3.7
	all	3,748.91	22,745	6.1
Downstream, ND	Eddy	644.23	2,757	4.3
	Griggs	716.18	2,754	3.8
	Steele	715.49	2,258	3.2
	Barnes	1,513.22	11,775	7.8
	Ransom	864.13	5,890	6.8
	Richland	1,445.74	17,998	12.4
	Cass	1,767.92	123,138	69.7
	Traill	862.54	8,477	9.8
	Grand Forks	1,439.84	66,109	45.9
	Walsh	1,294.11	12,389	9.6
	Pembina	1,121.79	8,585	7.7
	all	12,385.18	262,130	21.2
Downstream, MN	Clay	1,052.74	51,229	48.7
	Norman	876.83	7,442	8.5
	Polk	1,997.80	31,369	15.7
	Marshall	1,812.79	10,155	5.6
	Kittson	1,103.80	5,285	4.8
	all	6,843.96	105,480	15.4
Total		20,811.52	302,502	14.5

Source: U.S. Bureau of the Census. 2000.

Table 4
County Median Household Income
Devils Lake Study Area
1993, 1997
($2001)

Impact Zone	County	Median Household Income 1993	Median Household Income 1997	Change 1993 – 1997
Upper Basin	Towner	$27,846	$30,313	8.9%
	Cavalier	$31,275	$34,790	11.2%
Lake Area	Benson	$21,593	$24,327	12.7%
	Ramsey	$30,616	$33,822	10.5%
	Nelson	$27,422	$28,782	5.0%
Downstream, ND	Eddy	$26,591	$29,172	9.7%
	Griggs	$27,992	$31,319	11.9%
	Steele	$32,622	$36,390	11.5%
	Barnes	$28,298	$32,968	16.5%
	Ransom	$31,503	$36,572	16.1%
	Richland	$34,351	$40,771	18.7%
	Cass	$36,860	$43,311	17.5%
	Traill	$32,742	$39,179	19.7%
	Grand Forks	$34,401	$40,067	16.5%
	Walsh	$31,141	$33,256	6.8%
	Pembina	$33,630	$38,859	15.5%
Downstream, MN	Clay	$34,946	$42,019	20.2%
	Norman	$30,286	$32,890	8.6%
	Polk	$31,011	$35,796	15.4%
	Marshall	$30,332	$34,513	13.8%
	Kittson	$32,582	$34,787	6.8%
North Dakota		$30,451	$35,392	16.2%
Minnesota		$37,036	$46,342	25.1%
United States		$34,810	$41,232	18.5%
Consumer Price Index (Midwest urban)		$140.0	$156.7	11.9%

Source: U.S. Bureau of the Census. 2000.

Employment

Table 5 contains county unemployment rates for counties within the Devils Lake study area for the 1985-2000 period. This information is supplemented by current (September 2001) labor force and unemployment rates for these counties contained in Table 6. Both tables include state and national unemployment rates. As indicated in both tables, the counties in the upper basin and lake area have unemployment rates that are generally consistent with state and national averages. However, Benson County is an exception. This county continues to have a high unemployment rate relative to other area counties, the state, and the nation. High unemployment on the Fort Totten Indian Reservation is the most likely explanation for the high county unemployment.

Table 5
County Unemployment (1985-2000)
Devils Lake Study Area

Impact Zone	County	1985	1990	1995	2000
Upper Basin	Towner	4.3%	2.8%	2.7%	2.9%
	Cavalier	6.5%	4.0%	3.9%	3.2%
Lake Area	Benson	8.9%	7.8%	10.5%	7.9%
	Ramsey	6.1%	3.6%	3.2%	3.5%
	Nelson	7.1%	3.7%	3.6%	4.6%
Downstream, ND	Eddy	9.6%	6.3%	5.9%	5.0%
	Griggs	5.3%	2.1%	1.8%	2.0%
	Steele	4.5%	1.6%	1.9%	1.4%
	Barnes	6.2%	3.1%	2.5%	3.1%
	Ransom	4.2%	1.7%	1.9%	2.2%
	Richland	6.2%	4.5%	3.2%	2.6%
	Cass	3.6%	3.1%	2.0%	1.6%
	Traill	4.5%	3.9%	3.4%	3.0%
	Grand Forks	3.8%	4.5%	2.6%	2.7%
	Walsh	5.6%	4.5%	5.4%	4.2%
	Pembina	7.5%	8.5%	5.9%	6.9%
Downstream, MN	Clay	n/a	5.5%	3.7%	2.9%
	Norman	n/a	6.1%	5.4%	5.9%
	Polk	n/a	7.3%	5.0%	4.8%
	Marshall	n/a	12.8%	9.8%	11.3%
	Kittson	n/a	8.1%	6.4%	7.8%
North Dakota		5.9%	4.0%	3.3%	3.0%
Minnesota		6.0%	4.9%	3.7%	3.3%
United States		7.2%	5.6%	5.6%	4.0%

Source: U.S. Bureau of the Census. 2000.

Table 6
County Labor Force and Unemployment (Sept 2001)
Devils Lake Study Area *

Impact Zone	County	Labor Force	Employed	Unemployed	Unemployment Rate
Upper Basin	Towner	1,394	1,378	16	1.1%
	Cavalier	2,430	2,399	31	1.3%
	all	3,824	3,777	47	1.2%
Lake Area	Benson	2,615	2,482	133	5.1%
	Ramsey	5,937	5,834	103	1.7%
	Nelson	1,432	1,408	24	1.7%
	all	9,984	9,724	260	2.6%
Downstream, ND	Eddy	1,075	1,053	22	2.0%
	Griggs	1,554	1,540	14	0.9%
	Steele	1,284	1,275	9	0.7%
	Barnes	5,685	5,629	56	1.0%
	Ransom	2,876	2,847	29	1.0%
	Richland	8,963	8,824	139	1.6%
	Cass	73,765	73,128	637	0.9%
	Traill	3,605	3,547	58	1.60%
	Grand Forks	36,267	35,748	519	1.40%
	Walsh	6,194	6,087	107	1.70%
	Pembina	4,092	3,978	114	2.80%
	all	145,360	143,656	1,704	1.2%
Downstream, MN***	Clay	30,001	29,467	534	1.8%
	Norman	3,321	3,212	109	3.3%
	Polk	16,883	16,511	372	2.2%
	Marshall	4,652	4,457	195	4.2%
	Kittson	2,313	2,236	77	3.3%
	all	57,170	55,883	1,287	2.3%
North Dakota		336,661	330,832	5,829	1.7%
Minnesota		2,827,160	2,734,745	92,415	3.3%
United States		142,190	135,181	7,009	4.90%

*Based on September 2001 data from Job Service North Dakota and the Minnesota Work Force Center.

**Includes Fargo and West Fargo, ND.

***Includes the City of Moorhead, MN.

The primary employment sectors for each of the study area counties are shown in Table 7. The importance of the City of Devils Lake, located within Ramsey County, as a retail hub for the Devils Lake area is evident in retail trade employment. Recreation, accommodation and food services, and real estate are also important sectors in the economies of Ramsey County and Benson County, where tourism and lake-based recreation are primary economic engines. Larger urban centers in the downstream counties of Cass, Clay, and Polk support employment in a large number of diverse economic sectors, including manufacturing, wholesale and retail trade, real estate, professional services, waste management, health care, accommodations and food service.

Table 7
County Paid Employment in Primary Sectors (1997)
Devils Lake Study Area

Impact Zone	NAICS Code*	Manufacturing 31-33	Wholesale Trade 42	Retail Trade 44-45	Real Estate 53	Professional, Scientific, & Tech. Services 54	Waste Mgmt. & Remediation 56	Healthcare & Social Assist. 62	Arts, Entertainment & Recreation 71	Accommodation & Food Services 72	Other Services 81
Upper Basin	Towner	N.A.	20-99	87	23	12	N.A.	100-249	1-19	40	11
	Cavalier	N.A.	113	241	1-19	17	6	26	20-99	100-249	31
Lake Area	Benson	N.A.	36	76	20-99	2	1-19	1-19	250-499	20-99	1-19
	Ramsey	N.A.	374	1,014	161	51	59	209	45	551	91
	Nelson	N.A.	188	114	11	14	1-19	188	1-19	68	12
Downstream, ND	Eddy	42	59	N.A.	1-19	N.A.	N.A.	1-19	1-19	55	15
	Griggs	N.A.	83	133	1-19	1-19	20-99	1-19	1-19	71	15
	Steele	N.A.	42	51	1-19	1-19	1-19	1-19	1-19	21	16
	Barnes	N.A.	281	602	2	58	56	106	23	318	99
	Ransom	N.A.	154	275	8	15	1-19	60	19	176	24
	Richland	2,261	479	797	73	112	60	181	66	384	89
	Cass	6,757	5,945	9,697	1,067	2,318	3,977	5,939	769	7,184	2,507
	Traill	N.A.	293	314	1-19	31	7	73	21	363	39
	Grand Forks	1,737	1,511	5,596	524	790	1,032	5,504	270	4,126	1,016
	Walsh	N.A.	383	706	18	57	195	99	33	271	123
	Pembina	500-999	211	620	9	25	18	53	1-19	244	43
Downstream, MN	Clay	1,225	765	2,828	127	307	707	496	274	1,615	475
	Norman	N.A.	141	357	1-19	55	1-19	42	5	100-249	37
	Polk	1,350	415	1,377	66	154	73	2,029	57	1,127	430
	Marshall	N.A.	250-499	293	1-19	28	1-19	81	5	100-249	74
	Kittson	N.A.	171	220	10	23	1-19	157	1-19	20-99	18

Source: Economic Census. U.S. Bureau of the Census. 1997.
* The North American Industry Classification System (NAICS) has replaced the Standard Industrial Classifications (SIC) used prior to 1997.

Economy

The importance of agriculture to the economy of the Devils Lake area is again evident in Table 8, which presents the dollar value of final demand, as exports from the region, for the counties in the Devils Lake area (from Leistritz et al., 1999). Agriculture accounts for 48.3 percent of final demand in the Devils Lake regional economy. Federal activities and tourism follow with 38.2 percent and 10.2 percent, respectively. The data for Federal expenditures does not include emergency funds to respond to the rise of Devils Lake. Manufacturing accounts for only 3 percent of the final demand in counties in the Devils Lake region.

Table 8
Primary Economic Sectors and Sales for Final Demand (Exports)
Devils Lake Area Counties
1996
(millions of $2001)

County	Agriculture	Federal Activities	Tourism	Manufacturing	Total
Benson	78.5	51.0	8.6	12.1	150.2
Cavalier	121.4	59.9	13.5	1.0	195.8
Eddy	32.4	26.0	4.0	0.9	63.3
Nelson	64.6	26.9	6.5	0.9	98.9
Ramsey	77.7	149.3	47.8	9.1	283.9
Towner	60.7	30.6	11.5	5.9	108.8
Total	435.4	343.7	91.9	30.0	901.0
Percent	48.3%	38.2%	10.2%	3.3%	100%

Source: Leistritz et al. *Regional Economic Effects of Proposed Devils Lake Emergency Outlet,* For St. Paul District, U.S. Army Corps of Engineers, 1999.

Table 9 profiles the performance of the regional economy in recent years (from Leistritz et al. 1999). The counties included in the regional economy are consistent with the six counties profiled in Table 8. The depressed condition of the regional agricultural economy is again evident in this table. The decline in the agricultural sector has been a significant drag on the regional economy. The tourism and Federal activities sectors have grown significantly over the 1980-1996 period. However, manufacturing has also declined during this period. As a consequence of these economic developments, the relative importance of Federal activities and tourism in the regional economy has increased significantly from less than a third to more than half of total regional export value.

Table 9
Sales (Regional Exports)
Devils Lake Area Counties
1980-1996
(millions of $2001)

Year	Agriculture		Federal Activities		Tourism		Manufacturing		Total
	($million)	% of total	($million)	% of total	($million)	% of total	($million)	% of total	
1996	435.4	48.3%	343.7	38.1%	91.9	10.2%	30	3.3%	901.0
1995	397.4	46.0%	364.9	42.2%	71.6	8.3%	30.1	3.5%	864.0
1994	408.8	47.0%	377.2	43.4%	58	6.7%	25.9	3.0%	869.9
1993	365.1	45.7%	361.5	45.2%	49.4	6.2%	23.7	3.0%	799.7
1992	464.5	52.2%	359	40.4%	41.7	4.7%	24	2.7%	889.2
1991	461.6	53.3%	344.2	39.7%	38	4.4%	22.8	2.6%	866.6
1990	465	53.4%	347.7	39.9%	36.2	4.2%	22.7	2.6%	871.6
1985	680.3	63.8%	328.7	30.8%	31.3	2.9%	25.3	2.4%	1,065.6
1980	603.9	62.9%	288.1	30.0%	30.7	3.2%	36.9	3.8%	959.6

* Includes: Benson, Cavalier, Eddy, Nelson, Ramsey, and Towner Counties
Source: Leistritz et al. *Regional Economic Effects of Proposed Devils Lake Emergency Outlet,* For St. Paul District, U.S. Army Corps of Engineers, 1999.

Land use

Agriculture dominates land use in the lake region and downstream along the Sheyenne River and Red River. Figure 5 illustrates agricultural land use in the Devils Lake area. Information on urban and suburban land uses was not available. Table 10 complements Figure 5 by providing county summaries of agricultural land use. Wheat, barley, and sunflowers are the most common crops, and some farms raise beef cattle.

Agricultural Land Use (acres)
Lake Area Counties
1997

Agricultural Land Use Category	Benson	Ramsey	Nelson	Towner	Cavalier
< 15 % Cultivated Total	16,867	n.a.	n.a.	n.a.	n.a.
15 - 50 % Cultivated Total	158,598	53,339	465,878	651,237	140,305
51 - 75 % Cultivated Total	406,395	52,282	161,437	15,393	133,493
> 75 % Cultivated Total	321,847	676,849	465,878	651,237	695,117
Agricultural-Urban > 20 Homes Sq Mi Total	4,197	3,789	2,564	635	2,583
Resort > 20 Homes Sq Mi Total	1,539	491	n.a.	n.a.	n.a.

Source: U.S. Dept. of Agriculture, National Agricultural Statistical Service, 2000.

Transportation

The Devils Lake region has an excellent transportation network, including railways, airports, and roadways (see Figure 6). Highway access to the region is provided by Interstate 94, which runs east-west to the south of Devils Lake through the Fargo-Moorhead metropolitan area, Valley City, and on to the state capitol at Bismarck, and Interstate 29, which runs north-south just west of the Red River. Highway 2 connects the City of Devils Lake and the City of Grand Forks. Highway 281 and Highway 52 connect Devils Lake and Jamestown to the south. A web of state and county roadways accommodates local traffic. Airports in the study area include the Hector International Airport in Fargo, the Grand Forks International Airport, and the Devils Lake Municipal Airport.

The study area has rail transportation which provides both passenger (Amtrak) and commodity (agricultural) transport in the study area. Amtrak provides service to Devils Lake, Fargo, Grand Forks, Pembina, and Rugby. Burlington Northern Santa Fe Railway (BNSF) and Canadian Pacific Railway (CPR) also own railways within the study area. The Red River Valley & Western (RRV&W) Railroad spur line to Minnewaukan was recently closed. The Northern Pacific Railroad (NPR) line from the City of Devils Lake to Harlowe was closed in 1998. The BNSF line that runs along US Highway 2 is a major artery in the Upper Midwest's railroad system. Trains using this rail line have routes that extend from the State of New York to the State of Washington. The other two rail lines that are shown as features are spur lines that provide service to collect grain from local grain elevators and deliver fertilizer to the area.

Recreation

Devils Lake serves as an important regional recreation resource. Every year, it attracts thousands of resident and nonresident hunters and fishermen. Local expenditures of these visitors are an important component of the area economy. There are a variety of recreation facilities around the lake, which are described below.

Devils Lake Wetland Management District: The U.S. Fish and Wildlife Service (USFWS) manages approximately 235,000 acres of wetlands and other wildlife habitat in its Devils Lake Wetland Management District (WMD). The WMD includes 207 separate Waterfowl Production Areas and a variety of other facilities in the lake region. The management objectives of the WMD are wetland habitat preservation, waterfowl production, maintenance of migration habitat, and provision of winter cover for resident wildlife.

Sullys Hill National Game Preserve: Located on the south shore of Devils Lake, this preserve is part of the Devils Lake WMD. Established in 1904, Sullys Hill consists of 1,674 acres of wooded hills and open meadows. It is one of four preserves managed by the USFWS for American bison and elk.

Grahams Island State Park: Located on the northern shore approximately 10 miles west of the City of Devils Lake, Grahams Island has a year-round camping facility with 44 sites and a boat ramp. The camping facilities at Graham Island have been moved several times in response to lake level rise in recent years. The boat ramp has had several extensions.

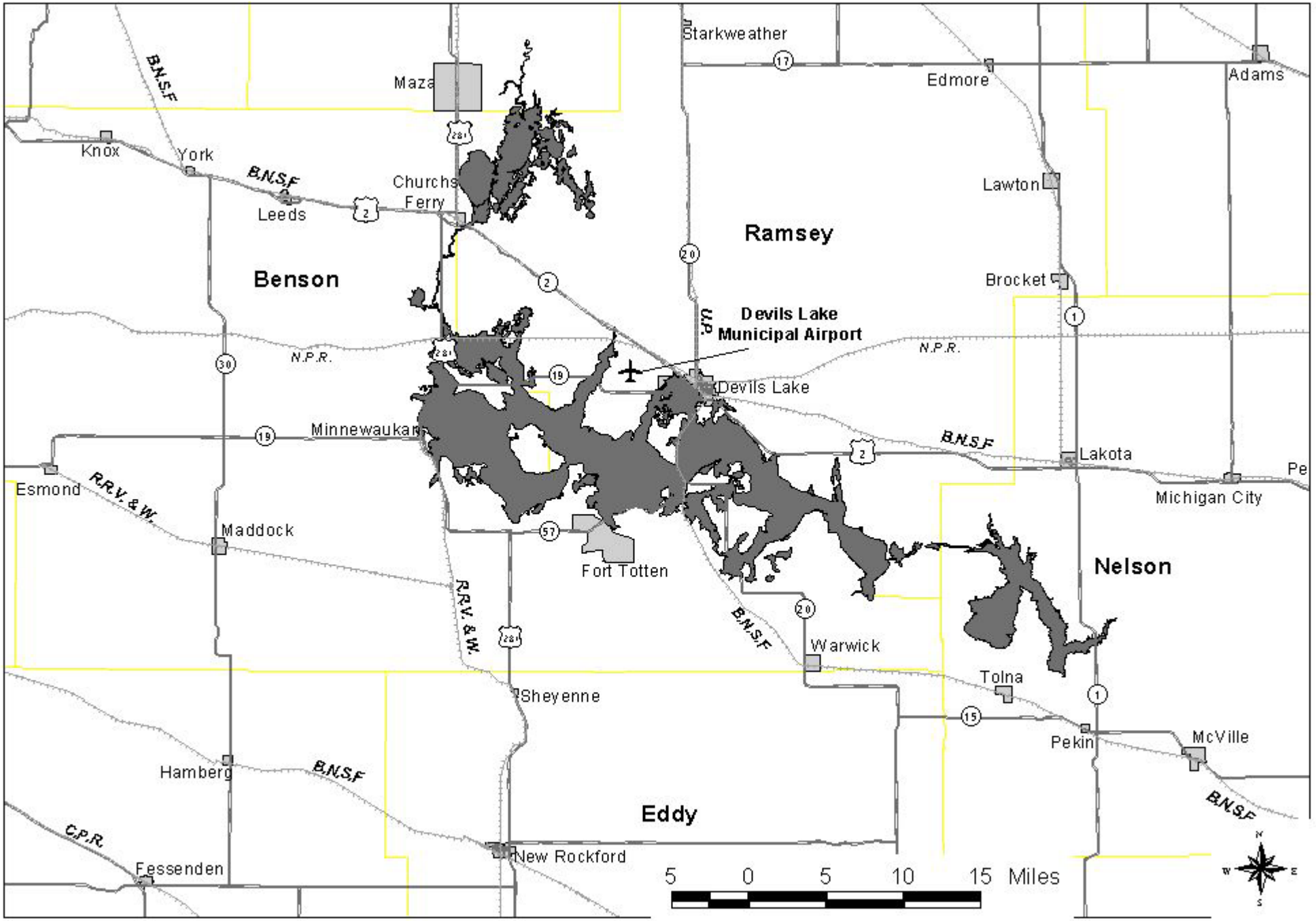

Figure 6. Transportation in the Devils Lake Area

Shelvers Grove State Park: Located three miles east of the City of Devils Lake, Shelvers Grove is a seasonal camping facility with 26 sites.

Black Tiger Bay State Recreation Area: Located on the south shore of the East Bay, Black Tiger Bay has a boat ramp for lake access.

Lake level rise since 1993 has had significant impacts on some of these recreation facilities. For example, Grahams Island State Park was closed in 1997 to relocate facilities to higher ground and raise the access road. In addition, many boat ramps around the lake have been modified repeatedly in response to higher lake levels. It is likely that further lake level rise would require additional relocation or modification of recreation facilities around the lake. If the lake level reaches 1,450 feet asl, the single access road to Grahams Island State Park would be inundated, and this facility would be closed until road access is reestablished. Access to other lakeside recreation facilities could be impaired or prohibited by further lake rise.

Visitation to the three Devils Lake parks for the 1996-2000 period is summarized in Table 11. Sullys Hill Preserve has experienced significant increases in visitation during recent years. Grahams Island has had some growth in visitation, but its visitation records are clouded by its temporary closure in 1997. Shelvers Grove visitation has been relatively stable during the 1996-2000 period.

Table 11
Visitors to Devils Lake Parks
1996-2000

	1996	1997	1998	1999	2000
Sullys Hill Nation Game Preserve	n.a.	22,580	34,587	23,370	38,059
Grahams Island State Park	62,265	16,174*	57,407	73,770	71,694
Shelvers Grove State Recreation Area	23,648	24,352	20,360	20,212	20,556
	85,913	63,106	112,354	117,352	130,309

* Grahams Island was closed for most of 1997 by flooding of access road
Source: USFWS. Devils Lake WMD.

The data in Table 11 do not fully indicate the how Devils Lake recreation that has been affected by the rising lake. The principal recreation amenity of Devils Lake that could be impacted by further lake level fluctuations is its year-round sportfishery. Hunting, which is another popular activity in the Devils Lake area, has only experienced minor improvements as a result of recent lake level rise and is not addressed in detail in this investigation.

Open water and ice fishing have greatly improved since the lake level began to rise in 1993. The lake's expansion has created excellent fish habitat with large additions of shallow waters interspersed with trees and other debris. This has allowed natural reproduction of some sport species that were previously maintained only by the state's fish stocking program. The boom in Devils Lake fishing is illustrated in Table 12, which contains annual fishing hours for Devils

Lake estimated using angler surveys conducted every three years for the North Dakota Department of Game and Fish by North Dakota State University.

Table 12
Devils Lake Fishing Activity
1992, 1995-1996, 1998-1999
(hours)

	1992	1995-1996	1998-1999
Open Water Fishing			
Boat	274,671	165,656	339,456
Shore	49,282	42,920	130,144
Subtotal	323,953	208,576	469,600
Ice Fishing	n.a.	272,593	449,007
Total	n.a.	481,169	918,607

Source: *Angler User and Sport Fishing Catch Survey on Devils Lake (1998-1999).* L. Brooks, R. Hiltner. 1999.

Walleye, White Bass, Northern Pike, and Yellow Perch are among the favorite fish species in Devils Lake (see Table 13). Walleye is the first choice of Devils Lake fishermen during the open water and ice fishing seasons, but the walleye catch is much greater during the open water season. The angler surveys and anecdotal evidence suggest that Devils Lake fishermen also value the variety of sport fishery in Devils Lake.

Table 13
Devils Lake Seasonal Fish Catch
1998-1999

Species	Open Water	Ice	Total
Walleye	434,515	197,747	632,262
White Bass	12,125	486,583	498,708
Northern Pike	112,326	3,900	116,226
Yellow Perch	88,225	12,066	100,291
Total	647,191	700,296	1,347,487

Source: *Angler User and Sport Fishing Catch Survey on Devils Lake (1998-1999).* L. Brooks, R. Hiltner. 1999.

Open water and ice fishing activity fell from 1992 to 1995-1996 and more than rebounded by 1998-1999. Table 14 contains walleye catch rates developed through the three angler surveys. The catch rates suggest that the quality of fishing initially fell with the lake rise and then increased as the population expanded with reproduction in the newly inundated areas. The supposition that the quality of the fishing improved is supported by increased harvest rates reported by the angler surveys, from 45 percent in 1992 to 73 percent in 1998-1999. As indicated in Table 15, the expansion of the Devils Lake has been accompanied by increased fish stocking rates by North Dakota Game and Fish Department. While this may qualify the catch rates in Table 14, it can be concluded that the good fishing on Devils Lake can be attributed to

favorable lake conditions and an effective stocking program. The increased fishing activity indicated in Table 12 was likely in response to improved fishing conditions manifested as greater catch rates and larger fish.

Table 14
Devils Lake Area and Walleye Catch Rates
1992, 1995-1996, 1998-1999
(hours)

	1992	1995-1996	1998-1999
Lake Area (acres)	45,000	72,000	106,000
Walleye Angler Catch rate (fish/hr)	0.30	0.10	0.40
Walleye Boat Catch rate (fish/hr)	1.83	0.24	0.96
Walleye Harvest Rate (lbs/ac)	1.30	0.47	1.49

Source: *Angler User and Sport Fishing Catch Survey on Devils Lake (1998-1999)*. L. Brooks, R. Hiltner. 1999.

Table 15
Devils Lake Fish Stocking
1995-2000

	1995	1996	1997	1998	1999	2000
Walleye – fingerlings	47,750	856,309	904,923	582,532	807,810	900,000
yellow perch						
Adult	2,990	0	0	0	0	0
fingerlings	100,550	0	0	0	0	0

Source: North Dakota Game and Fish.

The increase in the quality of fishing and the consequent increase in fishing activity has significant implications for the Devils Lake economy. As estimated by the 1998-1999 angler survey, nonresidents account for approximately seven percent of open water fishing and 21 percent of ice fishing in Devils Lake. The average open-water fishing trip to Devils Lake involves 111 miles of one-way travel. The average one-way trip for ice fishing was estimated at 137 miles. The travel by fishermen to Devils Lake implies significant expenditures in the Devils Lake area by visitors from outside the area. The impact of recreation expenditures on the regional economy will be discussed as part of the examination of anticipated effects of the alternative plans on the regional economy.

PHYSICAL EFFECTS OF WITH- AND WITHOUT-PROJECT FUTURE CONDITIONS

The social and local economic effects of the alternative plans are secondary effects that are based upon anticipated physical conditions associated with each plan. The effects of each plan are based upon comparison of the with- and without-project conditions. In the case of Devils Lake,

the without-project conditions could involve significant adverse social and local economic effects, as suggested by recent experience with the rising lake. It is the difference of effects between the with- and without-project conditions (i.e., the relative – not absolute – effects of the alternatives) that are relevant to decision making regarding Devils Lake.

The Corps has conducted stochastic and scenario modeling of alternative future conditions in the Devils Lake study area as part of the Devils Lake planning process. The principal physical effects that were used to assess social and local economic effects include:

- Devils Lake levels and inundated areas,
- Potential natural overflow to the Sheyenne River,
- Water quality effects of outlet releases downstream along the Sheyenne River and Red River,
- Water quantity effects of outlet releases downstream, including flooding and other effects,
- Water quality effects of outlet releases on Devils Lake,
- Physical features of alternative plans, and
- Construction activities.

The physical effects of the alternative plans have been evaluated as part of the Devils Lake planning process. The comparisons of with- and without-project conditions in the social impact assessment draws heavily upon the results of physical models used to assess the technical feasibility of the alternative plans. The physical effects of the alternative plans are summarized below to provide context for interpretation of their social and local economic effects. Discussions include anticipated performance of the alternative plans in addressing flooding problems around Devils Lake and ancillary effects of the alternative plans.

Both without-project conditions (i.e., Overflow and No Overflow) include further rise of Devils Lake. The Pelican Lake outlet and upper basin storage were designed to inhibit or stop further rise of Devils Lake and prevent an uncontrolled overflow down Tolna Coulee.

Under all of the with- or without-project conditions, there would be significant variation in most of these physical effects over the 50-year period of analysis. For example, it is anticipated that some rise of the lake level would occur under all of the with- and without-project conditions. It is beyond the scope of this investigation to anticipate the social and local economic implications of each potential rise and fall of the lake modeled for the 50-year period of analysis. However, as in the case of all flood control investigations, the analytical focus is on the most severe effects during the period of analysis.

Devils Lake Levels and Inundated Areas

This investigation was initiated in response to the prospect of a continuing increase in the elevation of Devils Lake and an outward expansion of its inundated area. Figure 7 illustrates the area inundated with the current water surface elevation (1,445 feet asl used as proxy for 1,448 feet asl) and the lake overflow elevation of 1,460 feet asl. Figure 8 illustrates the implications of further rise of Devils Lake. If the lake continues to rise from its current level, it would expand outward significantly. With a rise from 1,448 feet asl to 1,460 feet asl, the area of the lake is expected to more than double from approximately 130,000 acres to approximately 300,000 acres. Most of the area inundated by this expansion would be toward the northwest, north of the West Bay.

The level of Devils Lake fluctuates naturally over time with the dynamic balance between runoff from the watershed and evaporation from the lake. Lake levels associated with the with- and without-project conditions have been modeled using probability-based (stochastic) and climate-scenario approaches for the 50-year period of analysis. The results of the stochastic analysis are presented in Table 16, which contains the percent of stochastic traces in which lake levels equaled or exceeded specific elevations. The table indicates the relative performance of two of the alternative plans in controlling lake levels. The expanded infrastructure alternative would not affect lake levels and would be consistent with the no action condition.

Table 16
Percent of Traces That Equal or Exceed Specified Elevation
Stochastic Hydrologic Analysis

Lake Level Elevation	No Action	Pelican Lake Outlet 300 cfs	Upper Basin Storage
1,450 ft.	50.6%	36.1%	45.6%
1,453 ft.	29.3%	16.2%	25.4%
1,455 ft.	20.4%	10.6%	17.3%
1,459 ft.	9.4%	4.1%	7.7%

The modeling results in Table 16 confirm several expectations about the alternative plans. First, the No-Action (without-project) condition would likely result in significantly higher lake levels than under the with-project conditions (i.e., the Pelican Lake outlet and upper basin storage). Second, upper basin storage would provide some control over lake levels relative to the No Action condition, but this alternative is far less effective than the constrained Pelican Lake outlet.

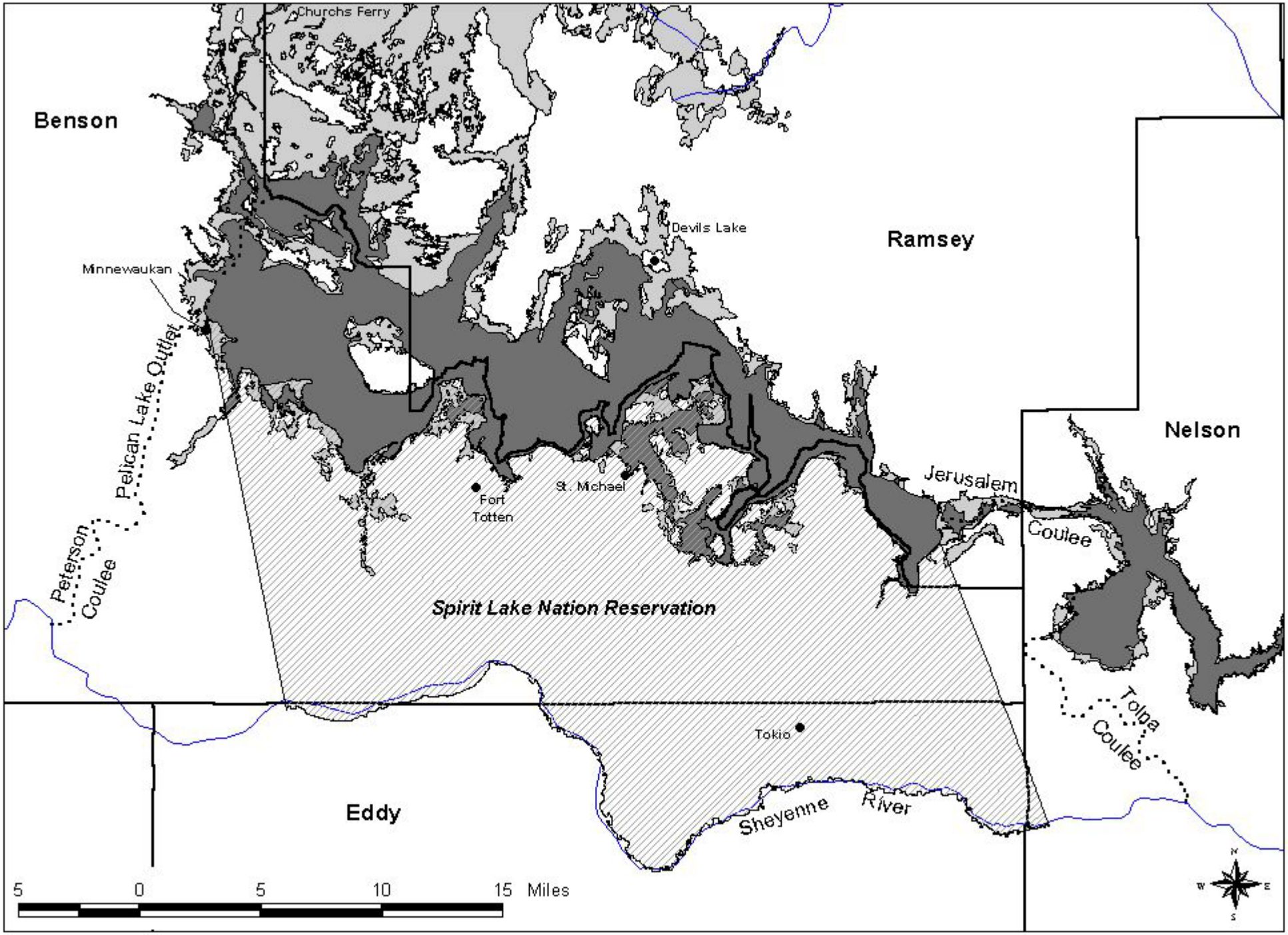

Figure 7. Area Impacted as Lake Level Rises

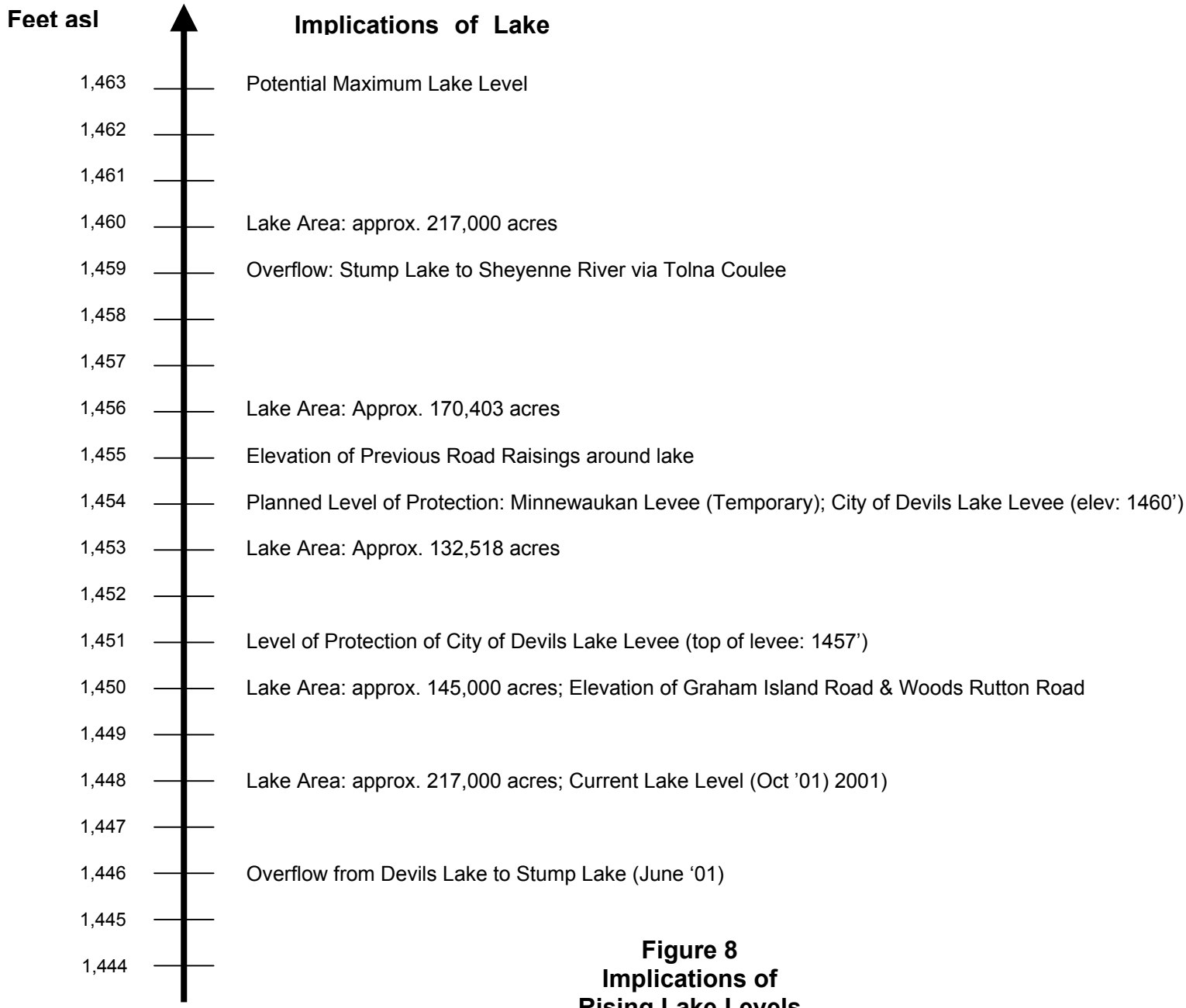

Figure 8
Implications of
Rising Lake Levels

The relative performance of the alternative plans is again illustrated in Table 17, which contains the peak elevation reduction and 50-year elevation reduction expected to result from the alternative plans under the Wet Future climate scenario. As indicated previously and confirmed in Table 17, the Wet scenario would result in lake levels reaching the overflow elevation under the without-project condition. However, under the Wet scenario the overflow elevation would also be reached with the upper basin storage alternative. The constrained Pelican Lake outlet would be expected to prevent an overflow and to significantly lower lake levels during the 50-year period of analysis.

Table 17
Peak and 50th Year Elevations
With- and Without-Project Conditions
Wet Future Climate Scenario

	Peak Elevation (feet asl)	Peak Reduction (feet)	Elevation After 50 Years (feet asl)	Reduction After 50 Years (feet)
Without-Project	1,460.59		1,450.59	
Pelican Lake Outlet - Constrained	1,457.35	3.24	1,444.03	6.56
Upper Basin Storage	1,460.41	0.02	1,449.75	0.84

Potential Natural Overflow to the Sheyenne River

An uncontrolled overflow from Devils Lake would pass southward from East Stump Lake through Tolna Coulee into the Sheyenne River (see Figure 6). As part of the without-project condition, it is assumed that minimal erosion would occur during overflow. Although the soils along the outlet route are considered moderately to highly erodible, the assumption is based on uncertainties regarding the amount of overflow and the erodibility of the soils and on the conjecture that State or Federal agencies would armor the overflow route to limit the rate of discharge. If it is assumed that there would be no erosion of the outlet, the anticipated peak discharge of the overflow would be 550 cfs. The water quality and flooding implications of the various outlet alternatives are discussed below. Uncontrolled release of 550 cfs from Devils Lake could have significant adverse effects on the Sheyenne River and the Red River.

The 11 additional feet required to raise Devils Lake to its overflow elevation may seem small relative to the 27-foot rise elevation since 1993. However, the configuration of the basin requires a disproportionate increase in the amount of water for each additional foot of lake elevation. The increase in lake area from elevation 1,450 to 1,459 is illustrated in Figure 8. The huge volume of additional water required to reach the overflow elevation makes an overflow event during the 50-year period of analysis unlikely. The probability-based (stochastic) analysis of lake levels indicates that an overflow event during the 50-year period of analysis has a probability of less than 10 percent (see Table 17). The pessimistic climate assumptions that comprise the Wet Future climate scenario are required to produce an overflow in the lake level modeling, an event that would not occur until 2018. Nevertheless, the consequences of an

uncontrolled overflow are potentially catastrophic. For this reason the low-probability, high-impact overflow event is included as one of the without-project conditions.

The results of the stochastic hydrologic and hydraulic modeling in Table 17 suggest the potential for Devils Lake levels to reach the overflow elevation (i.e., 1,459 asl). Under the No Action condition, 9.4 percent of the stochastic traces have lake levels that equal or exceed the overflow elevation. As indicated in Table 17, the Pelican Lake outlet would significantly reduce the likelihood of an overflow.

Water Quality Effects of Outlet Releases Downstream

The potential water quality effects of releases from the constrained Pelican Lake outlet on the Sheyenne River and on the Red River would depend on the qualities and quantities of the outlet discharge and the receiving waters. The Pelican Lake outlet has been formulated to minimize downstream water quality impacts of a Devils Lake outlet.

Evaporation from Devils Lake concentrates dissolved solids transported by runoff from the watershed, including chlorides and sulfates. Approximately one-half of total dissolved solids (TDS) in Devils Lake are comprised of sulfates. TDS concentrations in Devils Lake increase from east to west due to the inflow of fresh water from the northwest. For example, in 1997 when the lake level was 1,443 feet asl, the following east-to-west TDS gradient was in effect: West Bay (1,100 mg/L), East Bay (6,600 mg/L), and East Stump Lake (14,000 mg/L). In contrast, the average TDS concentration for the Sheyenne River during the 1951-1995 period was 480 mg/L. The influx of fresh water during recent years has reduced TDS concentrations in Devils Lake through dilution.

The Sheyenne River is classified by the State of North Dakota as a Class 1A stream. This classification does not have a TDS standard, but it does have a sulfate standard of 450 mg/L. The State of Minnesota has the following standards for the Red River: TDS (500 mg/L) and sulfates (250 mg/L), plus other standards that are largely contingent on TDS concentrations. The 1909 Boundary Waters Treaty with Canada has water quality objectives, but it does not have specific water quality standards. The Boundary Waters Treaty has water quality objectives for the Red River that are consistent with Minnesota's water quality standards.

Mercury is of particular water quality concern for a Devils Lake outlet. Methyl mercury is a naturally occurring compound that is found in soils throughout North Dakota. When these mercury-bearing soils are saturated, they release methyl mercury into solution. The mercury then bioaccumulates in fish. This has prompted a fish consumption advisory by the North Dakota Department of Health for the entire state. The advisory suggests frequency of fish consumption for populations at risk, such as children and pregnant or nursing women. Further rise of Devils Lake could release additional methyl mercury into the lake and into the Sheyenne River and Red River via an outlet.

The State of North Dakota has an antidegradation statute which calls for a State review procedure when proposed actions would have a significant effect on water quality, defined as greater than 15 percent for any regulated water quality parameter. This statute would apply to the Sheyenne River and the Red River.

As discussed in the above descriptions of the alternative plans, releases from the constrained Pelican Lake outlet would be limited in volume and would only occur in accordance with the ability of receiving waters to meet water quality standards and to accept the volume without exceeding bankfull capacity (i.e., induce flooding). However, even constrained outlet releases are expected to result in significant increases of TDS and sulfate concentrations in the Sheyenne River and Red River.

The Corps has conducted extensive water quality modeling as part of the evaluation of alternative plans. The results of the water quality modeling are illustrated in Table 18, which contains percents of time specified concentrations of sulfate and TDS are equaled or exceeded at two selected locations: Valley City along the Sheyenne River, and Grand Forks along the Red River. The information in this table was generated using the Wet Future climate scenario. Using information in this table, the base conditions, Pelican Lake outlet, and overflow event can be compared to water quality standards for the Sheyenne River and Red River.

Table 18
Modeled Percent of Time Water Quality Concentrations Equaled or Exceeded With- and Without-Project Conditions
(Wet Future climate scenario**: 2005-2014 period)**

	Sulfate Sheyenne River at Valley City		**Total Dissolved Solids** Red River at Grand Forks**	
Future Condition	**>150 mg/L**	**>450 mg/L***	**>400 mg/L**	**>500 mg/L****
Without-Project	35	0	7	0
Pelican Lake - constrained	76	0	20	0
Overflow	Sustained: 1,200 mg/L		Sustained: 400-500 mg/L	

* Sheyenne River Sulfate Standard (North Dakota): 450 mg/L
** Red River TDS Standard (Minnesota): 500 mg/L
Source: U.S. Army Corps of Engineers

Several conclusions about water quality issues surrounding Devils Lake can be drawn from Table 18. First, an overflow event would have severe water quality effects on these waterways. Second, the constrained Pelican Lake outlet would reduce water quality in these waterways, but the resulting water quality would nonetheless be within established standards.

Water Quantity Effects of Outlet Releases Downstream

It is likely that downstream water quantity effects of outlet releases would be primarily realized in the upper reaches of the Sheyenne River (i.e., above Lake Ashtabula). From Peterson Coulee to the upper limit of Lake Ashtabula the Sheyenne River has a bankfull capacity of approximately 600 cfs. Below Baldhill Dam, which impounds Lake Ashtabula, the Sheyenne River's bankfull capacity increases significantly to approximately 2,500 cfs.

As discussed above, constrained outlet releases (i.e., 300 cfs) would be limited to periods when releases would not induce or exacerbate flooding along the Sheyenne River. However, the

increased flows could potentially increase erosion and deposition processes along the upper Sheyenne, potentially impacting the riparian zone, and could raise water tables along the river.

As part of the Devils Lake planning process, extensive hydrologic modeling of the effects of an outlet on the Sheyenne River and on the Red River has been conducted. Operation of the constrained outlet would be limited to periods when the Sheyenne River discharge is below bankfull capacity. Consequently, it is not anticipated that the constrained Pelican Lake outlet would exacerbate flooding along this river.

Water Quality Effects on Devils Lake from Outlet Releases

Outlet releases would affect water quality in Devils Lake. With the Pelican Lake outlet, there would be a trade-off between water quality in the lake and water quality downstream. As discussed previously, the Pelican Lake constrained outlet would intercept fresh water entering Devils Lake. The social and local economic effects of modified lake water quality would be limited to recreation effects (specifically fishing effects) due to modified ecological (salinity) conditions in the lake. Based on the hydrologic modeling of lake levels, no significant impacts on ecological conditions are expected to result from outlet operations. Consequently, no recreation impacts are anticipated.

Physical Features of Alternative Plans

The implementation of the alternative plans would involve installation of water control systems with permanent physical facilities on the landscape. Expanded Infrastructure measures would involve additional levees along the lakeshore. The physical facilities of the Pelican Lake outlet would potentially include pipelines, open channels, and pumping stations. Enhanced upper basin storage would include many small impoundments to retain water in the watershed.

Construction Activities

In addition to the permanent facilities associated with the alternative plans, there would be temporary physical effects associated with construction activities. Although these activities may be temporary, in some cases they can induce permanent social or local economic effects.

EVALUATION CRITERIA

This social impact assessment applies a common set of impact categories to compare the with- and without-project conditions. The criteria were selected based upon NEPA requirements for social impact assessments, Corps policy guidance for EIS preparation, and issues identified through the NEPA scoping process. The criteria include:

Social Effects	**Local Economic Effects**
Population Relocation	Environmental Justice – Economic Aspects
Environmental Justice – Social Aspects	Transportation
Public Health	Agriculture
Public Safety	Energy Resources/Use
Noise levels	Employment
Aesthetic Values	Regional Growth
Recreation	Business Activity
Community Growth/Development	Property Values
Community Cohesion	Fiscal Effects
Land Use	Public Facilities/Services
Controversy	

SOCIAL IMPLICATIONS OF PHYSICAL EFFECTS

A broad discussion of the social issues that arise from the physical effects of the alternative plans is provided below using the social impact criteria previously described. A subsequent section provides a similar discussion of the local economic issues that arise from the physical effects of the alternative plans. These discussions serve as a reference for examinations of the social and local economic implications of the alternative plans, rather than having repetitive discussion of the same issues as the multiple with- and without-project conditions are compared.

Table 19 illustrates the organization of this section. The discussions are organized using the social impact evaluation criteria. For each of these criteria, potential physical effects of the alternative plans are discussed. Given the concern about further rise of Devils Lake, discussions of changes in lake level focus on implications of continued lake level rise. However, the hydrologic and hydraulic analyses conducted by the Corps suggest the significant potential for lake levels to fall over the 50-year period of analysis under with- and without-project conditions. Consequently, the potential for falling lake levels are also considered as a result of without-project fluctuations or implementation of an alternative plan. Discussion of each social impact evaluation criterion begins with an introductory description of the criterion and if and how the criterion has arisen as an issue during the lake's rise in recent years.

Table 19
Alignment of Alternative Physical Conditions and Social Impact Criteria

Social Impact Evaluation Criteria	Physical Effects of Alternative Plans: Further Rise of Lake Level	Overflow to Sheyenne River	Pelican Lake Outlet	Expanded Infrastructure	Upper Basin Storage	Physical Features and Construction
Population Relocation						
Environmental Justice – Social Aspects						
Public Health						
Public Safety						
Noise levels						
Aesthetic Values						
Recreation						
Community Growth/Development						
Community Cohesion						
Land Use						
Controversy						

Population Relocation

Since 1993, there have been 11 Presidential disaster declarations for the Devils Lake region. These declarations were made for regions within North Dakota that extended well beyond the Devils Lake area to address the effects of the climatic wet cycle, including flooding and agricultural impacts. Under emergency authorities, Federal agencies have moved or bought out and abandoned homes that were flooded by the rising lake. Approximately 400 homes around Devils Lake have been moved or abandoned in response to the rising lake waters. While some homes have been abandoned, most homes have been relocated. Some of the houses were second homes, but most were primary domiciles. The Federal Emergency Management Agency (FEMA) led this effort around most of the lake, but the Department of Housing and Urban Development (HUD) has taken responsibility for relocating many structures on the Fort Totten Indian Reservation. FEMA administers the National Flood Insurance Program (NFIP) through which the Federal government provides flood insurance for those communities that adopt floodplain management ordinances.

At the inception of the program, NFIP procedures were established for riverine flooding. These procedures, which were applied to Devils Lake structures during the initial years of flooding, required that homeowners wait 90 days after inundation to submit an NFIP claim. Claim payments were used to either move the house or buying the house and abandon it. In response to Devils Lake flooding, FEMA provided a waiver for these procedures for closed-basin lakes, allowing claims to be processed prior to flooding for those policy holders who signed up before November 1999. This waiver is contingent on local governments' endorsement of NFIP criteria, including establishing conservation easements on flooded property. In the event that a falling lake exposed previously-inundated properties, these easements would allow farming or temporary homes (e.g., trailers) but no permanent structures. There has been mixed reception by lakeside communities to the waiver/endorsement offer from FEMA. The economic costs of potential relocation induced by additional rise of Devils Lake have been accounted for in the NED analysis. Based on past experience in Devils Lake, the cost of moving a home is approximately 70 percent of market value, not including the new lot.

This relocation of over 400 homes has had significant short-term and long-term impacts on communities and individuals involved. It is likely that the physical conditions on the lake under the with- and without-project conditions would require additional relocations of homes and commercial structures with consequent social and local economic disruption.

The following discussions explore the social and local economic effects of population relocation. The short-term and long-term social impacts of additional lake rise are described first with subsequent exploration of potential population relocations associated with the alternative plans.

Short-Term Effects of Lakeside Population Displacement

Past experience with the rising lake provides a model for understanding the social and local economic impacts of population relocations. The short-term social and local economic impacts of the rise of Devils Lake are summarized below.

Dislocation of People's Lives: For many lakeside residents that have been forced to relocate due to rising lake levels, the dislocation has had significant adverse effects on their lives. The impacts have been diverse, depending on whether one's home was moved or abandoned and whether it was a primary or second home. The ability of the residents to cope with the change is determined by a variety of factors, including: personality, age, income, ethnicity, family support, and community support.

Although most of the monetary burdens of relocation were borne by Federal emergency funds, the social disruption caused by the relocations was severe for those involved. For relocated families, disruption included loss of neighbors, loss of community, economic losses not covered by Federal funds, and uncertainty about where to move. Those who were not directly involved were still affected, since many lakeside communities were fractured by the loss of neighbors.

Living With Uncertainty: Based on interviews with mental health professionals at the Lake Region Human Service Center (LRHSC) in the City of Devils Lake, the uncertainty associated with the rising lake took a significant toll on individuals and on the lakeside community. The LRHSC is one of eight regional, multi-functional centers maintained by the North Dakota

Department of Human Services. The slow, relentless creeping level of the lake over many years has caused significant anxiety for many lakeside residents. There is significant anticipatory stress regarding if and when the lake would rise to threaten one's home.

Crisis counseling is a standard element of a suite of post-disaster responses supported by FEMA through emergency grants to community health centers, such as LRHSC. Devils Lake represents a paradigm shift for crisis counseling, since the crisis of the rising lake has been characterized by an almost continuous incident period. For some whose properties are threatened by the rising lake, it has created a siege mentality. These people struggle to maintain normal lives, but they can experience considerable anticipatory stress about moving or losing their homes. One of the most stressful aspects of the rising lake has been the inability to control it. The inability to control one's future magnifies the stress of adversity.

According to the mental health professionals at LRHSC, many residents of the Devils Lake region pride themselves on being self-reliant and stoic in the face of adversity. In addition, the community over time has adjusted somewhat to the social effects of retreating from the advancing lake as the number of families dislocated has grown. These factors have increased community resilience, which has helped those dislocated by and those threatened by the rising lake cope with the anticipatory stress. However, the crisis of the rising lake has accompanied a multi-year downturn in farm economics, consisting of falling commodity prices, rising costs of farm inputs, and decreased productivity due to the continuing wet climatic cycle. Coupled with ongoing stressors such as lake level rise and the agricultural downturn, the impact of a trigger event, such as a death in the family, can prompt extreme emotional distress in even the strongest individuals.

The LRHSC mental health professionals characterize the farm crisis and the lake crisis as weighing heavily on the communities surrounding the lake. These stressors fall on communities which are lacking in mental health services. For those Native Americans living on the Fort Totten Indian Reservation, these problems are accompanied by a complex set of social and economic problems associated with reservation life.

The LRHSC professionals indicate that the additional stress on lakeside communities associated with the rising lake is difficult to isolate or quantify. They characterize this stress as supplementing a set of stressors that are already in place. Domestic violence, which is one indicator of community stress, has not increased in recent years. However, suicide continues to plague young people in the region, particularly Native Americans. The 1999 publication *Suicide in North Dakota* identifies suicide as the second leading cause of death for North Dakota children in the 10-14 year age group, the 15-19 year age group, and the 20-24 year age group. The national average suicide rate for children aged 10-14 years is 1.6 per thousand. The North Dakota average is 6.1 per thousand. North Dakota is ranked second among states for completed suicides of children 10-14 years and sixth for 15-19 years. The Fort Totten Indian Reservation has a suicide rate approximately 3.5 times greater than any other geographical area in North Dakota.

Impacts on Local Community: The impacts and anticipation of impacts on individuals have permeated communities surrounding Devils Lake. One community, the Town of Churchs Ferry (northwest of the City of Devils Lake), was entirely bought out by FEMA and abandoned in

2001. According to Ramsey County officials, some of the residents moved into the City of Devils Lake; others moved into other small towns in the area; and some residents left the Devils Lake area. The entire City of Minnewaukan (2000 population: 318), is at risk from the rising lake. In 1993, the City was 8 miles from the lakeshore. Currently, the lake is inundating parts of the City and threatening the entire community. In the case of Minnewaukan, the anticipatory stress experienced by individual homeowners is felt by the entire community. This relatively poor community has had to make difficult decisions about whether and how to protect City infrastructure from the rising waters. Full protection to 1,459 feet asl is not economically feasible. Consequently, the City must temper every decision with the uncertainty about whether or not the lake would go higher. A temporary levee has been proposed for the City with an anticipated level of protection to 1,454 feet asl. A potential buy out offer from FEMA may weaken the resolve of some residents and divide the community regarding the best course of action under the challenging circumstances.

Long-Term Effects of Lakeside Population Displacement

The long-term effects of relocations may be a significant reduction in quality of life for those who were forced to move. Whether their property was a primary or second home, the amenities at the new location may not equal those at the lakeside location. As in the case of Churchs Ferry, some residents who were forced to move may permanently leave the Devils Lake area. This social change could have economic implications as it weakens the structure and vitality of the community and local economy. Economic implications could include reductions in: (1) business activity, (2) the local tax base, and (3) the likelihood of business to make new investments in the Devils Lake area.

Population Relocations: Lake Level Changes

It is possible that several of the physical changes that are expected to accompany the alternative future conditions would induce additional population relocation. As discussed below, if the lake continues to rise under with- or without-project conditions, significant relocations may be required.

As estimated using average household size data from the 2000 Census, there are approximately 2,994 people living in the area potentially inundated by lake level rise (i.e., from the current level of 1,448 msl to the 1,459 msl overflow elevation). Most of this area is farmland, but there are many homes and other structures at risk. As indicated in Table 20, there are approximately 1,211 residential structures and 143 commercial and industrial structures between elevation 1,445 msl and 1,459 msl. Ramsey County contains more than 90 percent of the residential and commercial/industrial structures potentially affected by the rising lake.

Table 20
Residential and Commercial Structures
Between 1,445 and 1,459 asl
By County

County	Residential	Percent of Total	Commercial / Industrial	Percent of Total
Ramsey County	1,105	91.2%	138	96.5%
Benson County	59	4.9%	5	3.5%
Spirit Lake Reservation	47	3.9%	0	0.0%
Total	1,211		143	

Source: *Economics Database Update for the Lands and Developments Feasibility Study, Devils Lake, North Dakota*, U.S. Army Corps of Engineers, March, 1998.

Table 21 provides a profile of residential and commercial/industrial structures in Ramsey County that are below the overflow elevation of Devils Lake. Some of these structures are at risk from further rises in Devils Lake; others are not. Those structures inside the levee of the City of Devils Lake are not considered at risk, since the without-project condition assumes that the levee system would be raised as needed to protect the City in the event of additional lake rise. There are 917 residential structures protected by the levee and 188 residential structures unprotected. As indicated in this table, not all of the protected structures are located within the City limits. The vast majority of commercial/industrial structures at risk are inside the levee and within the city limits.

Table 21
Residential & Commercial Structures and Population
At Risk From Additional Lake Rise
Ramsey County

	Residential Structures*			Commercial Structures		
	Outside Levee	Inside Levee		Outside Levee	Inside Levee	
Lake Elevation (asl)		Within City of D.L.	Outside City of D.L.		Within City of D.L.	Outside City of D.L.
1,445-1,450	70 (168)	263 (631)	152 (365)	1	50	0
1,450-1,455	56 (134)	164 (394)	3 (7)	1	39	0
1,455-1,460	62 (149)	335 (804)	0 (0)	0	47	0
Total	188 (451)	762 (1,829)	155 (372)	2	136	0

* Population estimates derived by multiplying number of residential structures by Census 2000 average household size within affected tracts.
Source: *Economics Database Update for the Lands and Developments Feasibility Study, Devils Lake, North Dakota*, U.S. Army Corps of Engineers, March, 1998.

Table 22 contains a similar profile of residential and commercial/industrial structures at risk in Benson County and on the Fort Totten Indian Reservation. Most of the Benson County structures at risk are located in the City of Minnewaukan.

Table 22
Residential & Commercial Structures and Population
At Risk From Additional Lake Rise
Benson County

	Residential Structures*		Commercial/Industrial Structures	
Lake Elevation (asl)	Benson County	Fort Totten Indian Reservation	Benson County	Fort Totten Indian Reservation
1,445-1,450	26 (77)	23 (81)	0	0
1,450-1,455	25 (74)	14 (49)	5	0
Total	61 (181)	37 (130)	5	0

* Population estimates derived by multiplying number of residential structures by Census 2000 average household size within affected tracts.
Source: *Economics Database Update for the Lands and Developments Feasibility Study, Devils Lake, North Dakota*, U.S. Army Corps of Engineers, March, 1998.

Population Relocations: Overflow to the Sheyenne River

There are approximately 688 people living in the area along the overflow route through Tolna Coulee, estimated using 2000 Census data for census block groups along the coulee. The route passes through a rural area, and it is unlikely that any population relocations would be induced by the overflow through the Coulee. An uncontrolled overflow with an expected discharge of 550 cfs would likely result in significant flooding along the Sheyenne River between the overflow discharge point and Lake Ashtabula. The Devils Lake overflows would augment extant flows in the Sheyenne River. Depending on hydrologic conditions in the river during the duration of the overflow, there is significant potential to exceed the 600-cfs bankfull capacity of the upper Sheyenne.

Flooding along the Sheyenne River associated with an overflow might induce some relocations away from the river to higher ground. Table 23 profiles land use along the Sheyenne River above and below Baldhill Dam. One set of land use profiles applies to a river corridor extending one-quarter mile from each bank. The other set of land use profiles applies to the Sheyenne River floodplain. The floodplain is consistent with without-project river flooding and may not apply to flooding associated with a Devils Lake overflow. As indicated in this table, land use above the dam is primarily agricultural (cropland and grassland). There is more urban land below Baldhill Dam, but the bankfull capacity of the river below the dam is much more capable of accommodating Devils Lake overflows without inducing flooding.

The NED economic analysis anticipated some flooding damage along the Sheyenne River resulting from a Devils Lake overflow. Homeowners along the river may be induced to relocate in response to a Devils Lake overflow. The extent to which permanent relocations would occur would depend on a variety of factors, including the severity and duration of flooding, the particular locations of property at risk, and decisions by individual homeowners.

Table 23
Land Use Along Sheyenne River
(acres)

	¼-mile River Corridor			Floodplain		
Land Use	**Above Baldhill Dam**	**Below Baldhill Dam**	**Total**	**Above Baldhill Dam**	**Below Baldhill Dam**	**Total**
Cropland	12,166 (25%)	23,817 (37%)	35,983 (32%)	2,014 (20%)	788 (14%)	2,802 (18%)
Woodland	7,181 (15%)	13,125 (20%)	20,306 (18%)	2,669 (26%)	2,055 (36%)	4,724 (30%)
Grassland	21,141 (44%)	19,275 (30%)	40,416 (36%)	3,066 (30%)	889 (15%)	3,955 (25%)
Grass-Shrub	1,613 (3%)	2 (0%)	1,615 (1%)	179 (2%)	0 (0%)	179 (1%)
Wetland	5,709 (12%)	5,669 (9%)	11,378 (10%)	2,254 (22%)	1,606 (28%)	3,860 (24%)
Urban	56 (0%)	2,689 (4%)	2,745 (2%)	8 (0%)	427 (7%)	435 (3%)
Total	47,866	64,577	112,444	10,190	5,765	15,956

Source: U.S. Army Corps of Engineers

Population Relocations: Pelican Lake Outlet

There are approximately 1,828 people living in Census block groups intersected by the Pelican Lake outlet route. The outlet would comprise a small corridor through these block groups, and a relatively small portion of this population would be affected by the outlet. Detailed design of the outlet route and pumping facilities have not yet been developed. However, it is unlikely that that any significant population relocations would be induced by the Pelican Lake outlet due to the rural character of this area.

Population Relocations: Expanded Infrastructure

Expanded infrastructure measures could result in significant population relocations. Installation of new levees on the landward side of existing roads-as-levees could require some relocations, depending on the levee alignments. In addition, the flooding of land between the roads-as-levees and the new levees to equalize hydraulic pressure on the road embankments would inundate some areas that are currently protected by the embankments and could induce relocations in some cases.

Population Relocations: Upper Basin Storage

It is unlikely that enhancing the ability of the watershed to store water would induce significant population relocations. This alternative would involve impounding water in existing depressions in the watershed to detain stormwater runoff. It is likely that some sale of farmland would be

required to allow storage development. However, it is unlikely that there are many farmhouses and other structures located in depressions that would provide significant contributions to the storage potential of the basin.

Population Relocations: Physical Features and Construction

The physical features of the alternative plans and construction activities are not expected to induce population relocations. There may be some relocations associated with construction of a levee to protect Minnewaukan or with expansion of the levee protecting the City of Devils Lake. However, these actions would occur as part of without-project conditions and are therefore not included in this analysis.

Environmental Justice – Social Criteria

Potential population relocations associated with the alternative plans raise the issue of who would be impacted by the alternatives and the equity of those impacts. In 1994, President Clinton signed Executive Order 12898 to address environmental justice in minority populations and low-income populations. This order focuses Federal attention on environmental and health conditions in minority and low-income communities to ensure that all programs or activities receiving Federal financial assistance that affect human health or the environment do not directly or indirectly discriminate on the basis of race, color, or national origin.

As directed by the Executive Order, the goal of an environmental justice analysis is to determine whether minority or low-income communities would bear a disproportionate burden (economically, environmentally, or culturally) from implementation of the alternative plans. Assessment of the environmental justice of the alternative plans involves two principal criteria: minority populations and low-income populations. Potential impacts of the alternative plans on minority populations are discussed below. Potential impacts of the alternative plans on low-income populations are discussed later in this document in a section devoted to local economic effects.

In 2000, the Environmental Justice Program of the Environmental Protection Agency (EPA) prepared *Social Impacts of the Proposed Emergency Outlet to Control Flooding at Devils Lake, North Dakota: An Assessment of Environmental Justice.* The EPA examined the demographics of the Devils Lake study area, considered the potential for disproportionate impacts of an outlet from Devils Lake, stakeholder involvement, and potential benefits and burdens of an outlet. The goal of the study was to determine whether low-income communities or Tribes would have a disproportionate burden or benefit (economically, environmentally, or culturally). There is only one Federally-recognized Tribe in Devils Lake region: the Spirit Lake Sioux. Low-income communities are primarily located in Benson County, south and southwest of Devils Lake, but there are some low-income communities along the upper Sheyenne River. As part of its environmental justice analysis, the EPA sampled 45 respondents from around the study area that were selected as representative of the various interest groups and populations potentially affected by an outlet. Those not in favor of an outlet were concerned about: easements (restrictions and compensation), property damage, effects on property values, noise from outlet operation (i.e., pumps), impacts on cultural resources, and impacts on community and spiritual values. Many respondents to the EPA survey indicated that the City of Devils Lake and nearby farmers and

ranchers would be the principal beneficiaries of an outlet. Some respondents also felt that their views have not been heard or acted upon in the planning process.

The EPA environmental justice analysis provides insight into the perceptions of interest groups in the Devils Lake study area. This investigation supplements the EPA's environmental justice analysis with detailed evaluation of populations and communities potentially affected by the alternative plans to address flooding at Devils Lake. The environmental justice analysis is presented in two sections. The social analysis presented below examines the compositions of populations potentially affected by the alternative plans. In a subsequent section, the economic analysis will examine income profiles of those populations.

The population composition of study area counties are profiled in Table 26. The profile includes total population, age characteristics (e.g., population under age 18 and population over age 65), and ethnicity (e.g., white, black, Native American, and other). The county-level profile in this table can be used to identify areas of potential environmental justice concern. Benson County, which contains the Fort Totten Indian Reservation, is an area that merits particular scrutiny. As indicated in Table 26, this county has a Native American population that accounts for 48 percent of the total county population, and the county has a high percentage (36 percent) of population under the age of 18 (likely due to high reservation birth rates). The proximity of the reservation to the lake and potential overflow and outlet routes warrant detailed consideration of the potential environmental justice implications of the alternative plans.

Profile of Fort Totten Indian Reservation

The reservation of the Spirit Lake Nation Sioux Tribe (formerly the Devils Lake Sioux Tribe) is located between Devils Lake on the north and the Sheyenne River on the south (see Figure 3). The Spirit Lake Sioux belong to the Sisseton-Wahpeton Sioux Band. The reservation was established in 1867 by treaty between the United States and the Sisseton-Wahpeton Sioux Bands.

According to the 2000 Census, the total population on the reservation is 4,435 persons, which represents a population increase of 24 percent over the 1990 population of 3,574. Tribal trust acreage of the reservation is 53,239 acres, or 83.19 square miles. Residents are scattered throughout the reservation with concentrations in the communities of Fort Totten, St. Michael, Crow Hill, and Tokio/Wood Lake. Three small, incorporated towns, Warwick, Harmor, and Oberon, are also located within the reservation boundaries and have primarily Native American populations.

Based on the 2000 Census information, the median age of the reservation resident population is approximately 22.8 years. This is 13.4 years younger than the North Dakota State median age of 36.2 and 12.5 years younger than the United States median age of 35.3. The average household size on the reservation is 3.53, compared to 2.41 for North Dakota State and 2.59 for the United States.

Agriculture constitutes a major economic force for the tribe with much of it through the leasing of lands to outside interests. Both tribal and federal governments are a major source of employment, and the tribe maintains a 40-acre industrial park and owns two manufacturing enterprises that employ approximately 300 people. There is a gaming casino on the reservation.

Other attractions include the Fort Totten historical site, Sullys Hill National Game Preserve, and an archeological site.

The four major reservation communities contain tribal low-rent housing units, HUD homes, and mutual self-help homes exist in the four major reservation communities. In 1988, 45 HUD housing units were constructed. Rural farmsteads consist of privately-owned homes. Government quarters are maintained almost exclusively by the Bureau of Indian Affairs (BIA).

Environmental Justice (Social): Further Rise of Lake Level

Further rise of Devils Lake would impact Ramsey, Benson, and Nelson counties. Ramsey and Nelson counties do not contain large concentrations of minority populations. The lakeside location of the Fort Totten Indian Reservation in Benson County could imply that Native Americans could be disproportionately impacted by further lake rise. Table 24 contains profiles the population composition of areas subject to inundation if the lake rises from its current elevation (1,448 feet asl) to its overflow elevation (1,460 feet asl). This table is based on block-group data from the 2000 Census. As suggested by Table 24, Native Americans would potentially comprise a large percentage (29 percent) of the population at risk from further lake rise. However, the block groups are difficult to align with the area potentially inundated and their boundaries significantly exceed the limits of inundation. In addition, discussion with tribal representatives indicate that all structures below 1,460 feet asl have been relocated to higher ground, and further lake rise should not result in significant structural damage to properties in the reservation.

Environmental Justice (Social): Overflow to the Sheyenne River

Table 25 also contains a population profile of Census block groups along the Tolna Coulee overflow route. As indicated by this profile, no disproportionate impact on minority populations is expected by an overflow along this route. Some pasture and cropland on the Fort Totten Indian Reservation would be inundated if Devils Lake reached overflow elevation, but significant damages would not be expected due to prior relocations of structures at risk. Based on the population profile of downstream counties in Table 24, an overflow would not be expected to disproportionately affect minority populations downstream along the Sheyenne River and Red River.

Environmental Justice (Social): Pelican Lake Outlet

Table 25 also contains a population profile of Census block groups along the Pelican Lake outlet route, which includes Peterson Coulee. The information in Table 25 suggests that the Pelican Lake outlet may affect some Native Americans. Upon further research, it can be concluded that this outlet would not disproportionately affect Native Americans. The Native Americans identified in Table 25 as being along the outlet route are the result of the size and shape of the Census block groups which are intersected by the outlet route. Some of the block groups extend into the Fort Totten Indian Reservation, beyond the area potentially affected by the Pelican Lake outlet.

Table 24
2000 County Population Composition
Devils Lake Study Area

Impact Zone	County	Total Population	Under 18	% of total	65 years & over	% of total	White	% of total	Black or African American	% of total	American Indian	% of total	Asian, Other, or Combination	% of total
Upper Basin	Cavalier	4,831	1,188	25%	1,107	23%	4,739	98%	7	0.1%	25	0.5%	60	1.2%
	Towner	2,876	708	25%	670	23%	2,799	97%	2	0.1%	59	2.1%	16	0.6%
	Subtotal	7,707	1,896	25%	1,777	23%	7,538	98%	9	0.1%	84	1.1%	76	1.0%
Lake Area	Benson	6,964	2,513	36%	941	14%	3,541	51%	7	0.1%	3,346	48.0%	70	1.0%
	Ramsey	12,066	3,019	25%	2,266	19%	11,138	92%	25	0.2%	651	5.4%	252	2.1%
	Nelson	3,715	820	22%	1,019	27%	3,662	99%	3	0.1%	13	0.3%	37	1.0%
	Subtotal	22,745	6,352	28%	4,226	19%	18,341	81%	35	0.2%	4,010	17.6%	359	1.6%
Downstream, ND	Eddy	2,757	651	24%	682	25%	2,657	96%	2	0.1%	65	2.4%	33	1.2%
	Griggs	2,754	621	23%	708	26%	2,735	99%	0	0.0%	6	0.2%	13	0.5%
	Steele	2,258	624	28%	442	20%	2,220	98%	1	0.0%	14	0.6%	23	1.0%
	Barnes	11,775	2,624	22%	2,332	20%	11,529	98%	53	0.5%	90	0.8%	103	0.9%
	Ransom	5,890	1,471	25%	1,250	21%	5,768	98%	11	0.2%	19	0.3%	92	1.6%
	Richland	17,998	4,437	25%	2,746	15%	17,428	97%	62	0.3%	299	1.7%	209	1.2%
	Cass	123,138	28,848	23%	11,901	10%	117,106	95%	996	0.8%	1,325	1.1%	3,711	3.0%
	Traill	8,477	2,104	25%	1,623	19%	8,249	97%	9	0.1%	80	0.9%	139	1.6%
	Grand Forks	66,109	15,735	24%	6,368	10%	61,479	93%	904	1.4%	1,525	2.3%	2,201	3.3%
	Walsh	12,389	3,091	25%	2,390	19%	11,752	95%	41	0.3%	126	1.0%	470	3.8%
	Pembina	8,585	2,140	25%	1,674	19%	8,198	95%	13	0.2%	123	1.4%	251	2.9%
	Subtotal	262,130	62,346	24%	32,116	12%	249,121	95%	2,092	0.8%	3,672	1.4%	7,245	2.8%
Downstream, MN	Clay	51,229	12,822	25%	6,597	13%	48,149	94%	268	0.5%	740	1.4%	2,072	4.0%
	Norman	7,442	1,915	26%	1,558	21%	7,092	95%	8	0.1%	129	1.7%	213	2.9%
	Polk	31,369	8,128	26%	5,463	17%	29,543	94%	104	0.3%	408	1.3%	1,314	4.2%
	Marshall	10,155	2,583	25%	1,881	19%	9,873	97%	10	0.1%	29	0.3%	243	2.4%
	Kittson	5,285	1,325	25%	1,141	22%	5,184	98%	8	0.2%	14	0.3%	79	1.5%
	Subtotal	105,480	26,773	25%	16,640	16%	99,841	95%	398	0.4%	1,320	1.3%	3,921	3.7%
	Total	398,062	97,367	24%	54,759	14%	374,841	94%	2,534	0.6%	9,086	2.3%	11,601	2.9%

Source: U.S. Bureau of the Census.

Table 25
Population Profile of Census Block Groups Along Outlet/Overflow Routes
2000

2000 Census Block Level Data	Total population	Under 18	% of total	White	% of total	Black or African American	% of total	American Indian	% of total	Asian, Other, or Combination Asian	% of total
Further Lake Level Rise*	11,745	3,774	32%	8,211	70%	8	0.1%	3,405	29.0%	121	1.0%
Overflow: Tolna Coulee	688	156	23%	683	99%	-	0.0%	1	0.1%	4	0.6%
Pelican Lake Outlet	1,828	455	25%	1,736	95%	3	0.2%	66	3.6%	23	1.3%

* Assumes continued levee protection of City of Devils Lake
Source: U.S. Bureau of the Census.

Environmental Justice (Social): Expanded Infrastructure

The construction of levees landward of the road-as-levees could affect Native Americans disproportionately. Some of the lands currently protected by the roads-as-levees are located in the Fort Totten Indian Reservation, particularly in the vicinity of St. Michael. The resolution of 2000 Census data does not permit accurate alignment with areas potentially impacted by the expanded infrastructure alternative. While the overall impacts of this alternative on resident populations may be small, there is potential that Native Americans may be disproportionately affected.

Environmental Justice (Social): Upper Basin Storage

The enhancement of upper basin storage is not expected to have disproportionate effects on minority populations. As indicated in Table 26, those counties potentially involved with upper basin storage (i.e., Ramsey, Towner, and Cavalier) do not have significant minority populations.

Environmental Justice (Social): Physical Features and Construction

Construction activities associated with the alternative plans could have disproportionate effects on minority populations. Construction of the Pelican Lake outlet or expanded infrastructure could potentially generate large volumes of construction vehicles passing through the Fort Totten Indian Reservation.

Public Health

There are a variety of public health considerations that can be anticipated to result from implementation of the alternative plans. These include adverse health effects that have been experienced during the lake level rise of recent years and effects that could be inferred from the physical effects of the alternative plans. The health effects of the alternative plans are discussed below.

Health Effects: Further Rise of Lake Level

The mental health effects of the rising lake levels were previously discussed in the context of homeowners anticipating the need to relocate to higher ground. As evidenced during the lake rise of recent years, there are other notable health effects of the rising lake, including:

Chronic Wet Basements: The wet climatic cycle has raised water tables around the Devils Lake region. This has led to wet basements and problems with mold and mildew. There have been reports around the region of individuals with consequent respiratory problems. Areas around the lake are particularly exposed to these problems due to the high water table and humid atmospheric conditions.

Access to Health Care and Emergency Services: The City of Devils Lake serves as the principal health care center for the lake region. Facilities include Mercy Hospital, the Lake Region Nursing Home, and the Lake Region Clinic. Mercy Hospital is a 50-bed facility that serves Ramsey, Benson, Nelson, and Eddy counties. It includes primary care, acute care, laboratory services, surgery, a 24-hour emergency room, and outpatient services. The Hospital

has 157 full-time and 85 part-time employees. The Lake Region Nursing Home has 150 full-time and part-time employees. The Lake Region Clinic is a family-practice, internal medicine facility with general surgery and a laboratory. The Clinic has 13 physicians, 55 full-time, and 30 part-time employees.

As discussed previously, the rising lake has induced extensive road raising around the lake. Many lakeside roads have been temporarily closed during the construction periods. This has significantly decreased access of some communities (e.g., Minnewaukan) to emergency and non-emergency health care. Longer travel times to health care facilities have created significant inconvenience and anxiety in affected communities, especially for their senior citizens who have greater health care needs and greater difficulty with travel.

The prospect of rising lake levels affecting the regional health care service of the City of Devils Lake is uncertain due to the dilemma posed by the roads serving as dams and the challenges of conducting additional road raises. However, access to health care is one of the most compelling arguments for maintaining transportation access around the lake.

Effects on School-Aged Children: These transportation problems have similarly affected some school children that are bused around the lake to schools in the City of Devils Lake. When there has been lake-induced road construction during the school year, the commutes of some children have been dramatically increased. There has been concern among parents and school administrators that this may cause undue stress on this vulnerable group.

Sewer Systems and Septic Tanks: The rising lake has homes served by centralized wastewater treatment facilities and by septic tanks. Of the approximately 400 residential properties inundated by the lake, approximately 250 have been served by centralized wastewater treatment facilities, primarily Ramsey County Rural Utilities and the City of Minnewaukan. The remainder used individual septic systems. The health effects have been minimized by anticipation of the inundation. Centralized systems have been modified in response to the rising lake, and septic systems on flooding properties were emptied prior to inundation. Any wastewater leakage during these activities was dilute in the lake. Further lake rise would raise the same infrastructure issues, but the health effects are anticipated to be minor.

Health Effects: Overflow to the Sheyenne River

An overflow from Devils Lake has the potential to affect human health primarily through water quality effects on the Sheyenne River and Red River. In high concentrations, sulfates can induce diarrhea. However, there are no swimming advisories on Devils Lake. In addition, as described in the NED economic analysis, water supply purveyors along the Sheyenne River and Red River may need to seek alternate sources. Given the time required to achieve overflow elevation, there would be sufficient time to diversity water supplies.

As discussed previously, there is also the potential for a lake overflow to increase the mercury content of edible fish in the Sheyenne River and Red River. The bioaccumulation of mercury could adversely affect the health of fish consumers if the fish consumption advisory from the North Dakota Department of Health is not heeded.

Health Effects: Pelican Lake Outlet

The Pelican Lake outlet could also affect human health primarily through water quality effects similar to those described above for an overflow. Sulfate concentrations would be expected to be lower for an outlet, but mercury effects of an outlet could be the same or worse than an overflow depending on the duration of outlet operation. The NED analysis anticipates investments in water supply infrastructure that would be required with implementation of the Pelican Lake outlet. Although there may be some potential health effects before the investments are complete, these effects are expected to be insignificant due to anticipation of the water quality effects and to the relatively small scales of water supply systems involved.

Health Effects: Expanded Infrastructure

Increased upper basin storage is not anticipated to have adverse health effects.

Health Effects: Upper Basin Storage

It is not anticipated that increased upper basin storage would have adverse health effects. However, there may be some increase in groundwater levels in certain areas of the upper basin. This could exacerbate adverse respiratory effects of mold and mildew in basements. Given the effects of the wet climate cycle, the additional increment of dampness potentially associated with upper basin storage is expected to be insignificant.

Health Effects: Physical Features and Construction

There are not expected to be significant health effects associated with the physical features of the alternative plans or construction activities.

Public Safety

Public safety could be affected by implementation of the alternative plans. As discussed below, the principal safety issues involve flood risks, recreation risks, swimming risks downstream along the Sheyenne River, and transportation-related safety risks.

Safety Effects: Further Rise of Lake Level

There are two primary safety effects of the further rise of Devils Lake. First, as the lake inundates more land, floating debris is released. This debris is hazardous to Devils Lake boaters. Second, as the lake continues to rise, more roads around the lake would be impacted. A greater length of roadways would have smaller shoulders along raised embankments with steep walls dropping into the lake. If the lake goes up, there is additional pressure on the roads serving as levees, and motorists and those protected by the road-as-levee may be at risk. Additional road construction may recreate safety hazards associated with recent road raising, including dusty driving conditions with low visibility, high volumes of construction vehicles, and wave overwash of roadways with consequent low visibility, icy conditions, and debris problems. These roadways may be particularly dangerous during winter weather conditions when visibility is severely restricted. The lake could also threaten freight and passenger rail lines on the north side of the lake. However, Burlington Northern and Amtrak have committed to a track raise, which

should significantly reduce safety risks and potential economic effects for the rail industry and rail shippers.

There is another issue that concerns the behavioral response of populations at risk in the City of Devils Lake to the potential for the City's levee to fail. The potential for tornados and other severe weather, such as the macroburst in 2000, has accustomed residents of the City to seek shelter in response to emergency sirens. A warning siren for an impending levee failure could induce the same behavior. Rather than seek high ground, residents could inappropriately respond by seeking the nearest shelter. Ramsey County is currently revising its emergency action plan. The plan will include different siren patterns to direct people how to respond to different threats, including severe weather and levee break. Higher lake levels would result in greater flooding in the City if the levee failed and greater potential loss of life if residents respond inappropriately to warning sirens.

Safety Effects: Overflow to the Sheyenne River

The potential safety effects of an overflow to the Sheyenne River through Tolna Coulee are those associated with consequent flooding. Armoring the overflow route would control scour and thereby limit the discharge and consequent downstream flooding. The advance warning of a Devils Lake overflow should minimize the hazards, but there is still potential for individuals to not fully recognize the risks and expose themselves to the flood hazard.

Safety Effects: Pelican Lake Outlet

The constrained Pelican Lake outlet is not expected to exacerbate flooding problems along the Sheyenne River or the Red River. However, the Pelican Lake outlet may have safety effects for some downstream residents along the Sheyenne River. Some residents have expressed concern that higher summer flows in the Sheyenne River could pose a hazard for swimmers, canoeists, or others in or along the river who are accustomed to the modest summer flows currently experienced. It is likely that river recreationists would adjust to new river conditions if an outlet is developed. The above safety concerns, which would be particularly relevant during initial operation of the outlet, could be mitigated by a public information program to alert downstream residents and other river recreationists of the modified river regime.

Safety Effects: Expanded Infrastructure

Expanded infrastructure may significantly improve safety levels for some areas around the lake. Installation of new levees on the landward sides of existing roads-as-levees would be conducted for safety purposes. The risks of failure of the new levees would be much smaller than risks of failure of the road embankments serving as levees. Consequently, there would be a significant increase in safety for those living in areas protected by the roads-as-levees and for those motorists traveling along the roadways.

Safety Effects: Upper Basin Storage

No safety effects are anticipated in relation to increasing upper basin storage.

Safety Effects: Physical Features and Construction

There are not expected to be significant safety effects associated with the physical features of the alternative plans. As with all construction activities, there are risks associated with operation of heavy equipment and the movement of large construction materials. However, all construction contractors would be required to develop and institute safety plans.

Noise Effects

There is the potential that the alternative plans may have adverse effects on noise levels in some Devils Lake communities. Construction of the alternative plans would be the most direct means to influence noise levels, but operation of outlet pumps could also affect noise levels in nearby communities.

Noise Effects: Further Rise of Lake Level

The only significant noise effects anticipated to accompany further lake level rise are those associated with construction activities to raise levees and roads as part of the without-project conditions. This construction activity could generate significant amounts of noise at the construction site and along roadways used as an access route for construction equipment and materials. There may be some noise effects associated with house relocations in response to a rising lake, but these effects would be minor.

Noise Effects: Overflow to the Sheyenne River

No noise effects are anticipated to result from an overflow to the Sheyenne River.

Noise Effects: Pelican Lake Outlet

The operation of the outlet pumps could produce significant levels of noise. However, for multiple reasons, including noise, the pumps would be enclosed in a pumphouse. This will limit pumping noise. The noise effects of the high-head pumping operations are expected to be insignificant due to the potential locations of the pumping stations. It is expected that a Pelican Lake pumping station would be located north of Minnewaukan. Population densities are very low in this rural location, and the few nearby residents would not be expected to experience significant noise effects. In the development of plans and specifications for the pumping facilities, noise would be incorporated as a environmental feature, and appropriate noise abatement measures would be taken as needed.

Noise Effects: Expanded Infrastructure

The construction of levees landward of roads-as-levees could have some noise effects.

Noise Effects: Upper Basin Storage

No significant noise effects are anticipated in relation to increasing upper basin storage.

Noise Effects: Physical Features and Construction

As in the case of levee construction or road raising, construction of the alternative plans could produce significant short-term noise effects at the construction site and along routes used for construction transport of equipment and materials. This noise would be short-term with no long-term consequences. The potential noise effects of the outlet pumps were previously discussed.

Aesthetic Values

The alternative plans have the potential to affect aesthetic values in the study area. Fluctuations in lake levels and the operation and facilities of the alternative plans may impact aesthetic values in the study area. The potential consequences for recreation and tourism are discussed in subsequent sections of this document.

Aesthetic Values: Further Rise of Lake Level

Further rise of the lake may have positive and negative impacts on aesthetic values around the lake. Negative effects may include blockage of lake vistas for some lakeside residents due to levee construction or raised roads. Positive effects may include new or expanded lake vistas for not-at-risk residents around the lake. While the aesthetics of an expanded lake occupied by dead or dying trees may depend on the beholder, the aesthetics of mud-encrusted land exposed by receding waters in the distant future may be less subjective.

Aesthetic Values: Overflow to the Sheyenne River

An overflow through Tolna Coulee to the Sheyenne River could have adverse short-term effects on the aesthetics of the river's riparian corridor. The augmented flows of the river could accelerate erosion-deposition patterns along the river and could damage the riparian zone. The aesthetics for canoeists or other river recreationists could be adversely affected.

Aesthetic Values: Pelican Lake Outlet

The Pelican Lake outlet should have minimal impact on study area aesthetics. With the exceptions of the pumping stations and water control structures, the outlet facilities are expected to be largely underground. To the extent that outlet releases accelerate erosion-deposition patterns along the Sheyenne River and damage the riparian corridor as discussed above, there may be some aesthetic impacts associated with the outlet releases.

Some Spirit Lake Sioux living on the Fort Totten Indian Reservation object to a Devils Lake outlet on a spiritual basis, feeling that the lake level should be allowed to fluctuate freely and naturally. These individuals may be offended or disturbed by the taming of the lake with an outlet, and their appreciation of the aesthetics of the lake reduced as a consequence.

Aesthetic Values: Expanded Infrastructure

Expanded infrastructure around the lake may have some aesthetic impacts associated with blockage of lake vistas by new levees on the landward side of the roads-as-levees.

Aesthetic Values: Upper Basin Storage

No significant aesthetic effects are anticipated in relation to increasing upper basin storage.

Aesthetic Values: Physical Features and Construction

The potential aesthetic impacts of the physical features of expanded or new levees and road raisings were discussed above. There may be potential aesthetic impacts of construction activities as part of implementation of the alternative plans. However, those impacts would be short-lived.

Recreation

The physical effects of the alternative plans have the potential to influence the quantity and quality of recreation in the study area. The recreation implications of the alternatives are discussed below. Examination of tourism and expenditures of hunters and fishermen will be deferred until discussion of the local economic effects of the alternative plans.

Recreation: Lake Level Changes

As discussed in the above profile of existing conditions at Devils Lake, recreation at Devils Lake has thrived as the lake has risen. Based on the results of the stochastic analysis of lake levels in Table 17 and the Wet Future climate scenario evaluation of peak and 50^{th} year lake levels in Table 18, the lake level is expected to remain well above its historic average. Given the improvement in the quality and quantity of fishing in recent years, there is a positive relationship between lake levels and lake recreation. However, the rising lake has also inhibited recreation due to difficulties in accessing the lake and the cost of modifying recreation facilities in response to the lake's rise.

Recreation: Overflow to the Sheyenne River

Recreation along the upper Sheyenne River (i.e., from the outlet discharge to Lake Ashtabula) is limited to low-intensity canoeing and swimming. The lake was impounded by Baldhill Dam, which was completed in 1950. This Corps project was primarily intended to serve as a water supply facility to augment low flows on the Sheyenne River and on the Red River, but it is currently operated for flood control and recreation purposes, as well. The dam is located approximately 12 miles upstream from Valley City. Lake Ashtabula is 27 miles long and has an area of 5,234 acres. The lake is a popular recreation resource. In 2000, the lake received 165,200 visitors who spent more than 2.6 million visitor hours at the lake. The lake has a popular sport fishery consisting of walleye, northern pike, white bass, yellow perch, and black bullheads. Its facilities include four campgrounds, three swim areas, seven boat ramps, and 250 acres of associated lands. The maximum depth of the lake is 42 feet. Users surveys indicate that recreationists on Lake Ashtabula pursue the following activities: fishing (55 percent), boating (36 percent), camping (25 percent), picnicking (23 percent), hunting (17 percent), swimming (15 percent), sightseeing (7 percent), and water skiing (4 percent). Approximately 98 percent of the lake recreation occurs during the open water season.

As discussed above, an overflow to the Sheyenne River could have adverse consequences for recreation along the river by creating hazardous conditions for canoeists and swimmers or by reducing the aesthetics of the riparian zone.

An overflow could also adversely affect the fishery in Lake Ashtabula. As indicated in Table 19, an overflow from Devils Lake could have severe water quality impacts on the Sheyenne River, since the lake would overflow from its east end, which has the lowest water quality in Devils Lake. Since fishing accounts for 55 percent of the Lake Ashtabula's recreation activities, an adverse impact on the fishery from an overflow could have a disproportionate impact on the lake's recreation.

Some fishermen along the Sheyenne River and Red River have expressed concern that an overflow or an outlet could release striped bass into these rivers and damage the fishery. Discussions with fishery biologists with the North Dakota Department of Game and Fish indicate that a release of striped bass is unlikely and that their propagation is unlikely in these riverine conditions should such a release occur. In addition, based on angler surveys along the Red River, it is also unlikely that additional amounts of methyl mercury transferred from the lake to these rivers would have any adverse effects on fishing. The fish consumption advisory was previously discussed. The largest fish with the greatest bioaccumulation of mercury are channel catfish, and this is primarily a catch-and-release species.

Recreation: Pelican Lake Outlet

As discussed in the safety section, an outlet to the Sheyenne River could also affect recreation along the river by creating increasing flows and perhaps creating hazardous conditions for canoeists and swimmers. As discussed in the aesthetic values section, an outlet could also reduce the aesthetics of the riparian zone by accelerating erosion-deposition processes along the river or by affecting vegetation with higher ambient salinity levels.

Recreation: Expanded Infrastructure

Recreation effects of expanded infrastructure are expected to be insignificant. It is unlikely that levees built landward of the roads-as-levees would affect access to the lake.

Recreation: Upper Basin Storage

Recreation effects of upper basin storage are expected to be insignificant. However, there may be some benefits to wildlife and waterfowl by creating additional habitat.

Recreation: Physical Features and Construction

Construction activities associated with the alternative plans could temporarily affect the quality of recreation on the lake due to visual or noise effects, and may affect the quantity of recreation by temporarily impeding recreation access.

Community Growth/Development

The alternative plans could affect the prospects of communities in the study area for growth and development. The emphasis in this category is on social development, specifically whether or not the community is vibrant and poised for growth. The economic prospects of local communities are discussed with the local economic effects. The alternatives could affect community growth and development by affecting (1) the existence of the community, (2) the physical area needed for continued expansion, and (2) actual risks and perceived risks that threaten the community.

Community Growth/Development: Further Rise of Lake Level

The case of Churchs Ferry, discussed previously, provides an example of a community that ceased to exist as a result of the rising lake. This small community was being threatened by the rising waters of Devils Lake, which were backing up Mauvais Coulee (which surrounded the town). In 1999, FEMA proposed to buy out the residents of Churchs Ferry at a total cost of $3.5 million. In 2000, 52 of the 56 homes in the community were purchased by FEMA. There were 33 homes demolished and 19 homes moved. Of the six commercial structures in the community, four were razed, and two were moved.

The existence of the City of Minnewaukan is similarly threatened with inundation by further rise of Devils Lake. If the lake level reaches 1451 feet asl, much of the City would be inundated. As the lake has risen, area available for economic development of the community has been reduced. In addition, the threat of inundation hangs over the community, reducing the prospects for growth and development. Retention of young people in the community, creation of jobs, and attraction of new investments to this already shrinking community are further challenged by the threat of additional lake level rise.

The City of Devils Lake experiences similar challenges derived from the threat of the rising waters. The perceived risk may be more damaging to community vitality than actual risk. Although it is unlikely that the City of Devils Lake would be inundated, there is a perception propagated by media coverage of the rising lake that the City proper is at risk. According to economic development officials, multiple enterprises have postponed or deferred decisions on new investments in the City. This stigma reduces the vitality of the community and its ability to reverse the trend of population loss, through perceived economic stagnation in addition to problems associated with the lake.

Community Growth/Development: Overflow to the Sheyenne River

For those residents living near Tolna Coulee and downstream communities along the Sheyenne River, the prospect of an overflow from Devils Lake is alarming. The perceived risk has similar effects on those communities as were described above for the rising lake. However, these communities seem to be more concerned with an outlet from Devils Lake than with the possibility of an overflow. The perceived higher probability and lower consequence of an outlet seem to outweigh the lower probability and higher consequence of an overflow. If an overflow was more imminent, the balance of perceived risks would no doubt begin to change.

Community Growth/Development: Pelican Lake Outlet

The Pelican Lake outlet could have significant impacts on the growth and development of lakeside communities and communities downstream along the Sheyenne River. An outlet is perceived as a positive development for lakeside communities, such as the City of Devils Lake or the City of Minnewaukan. Conversely, an outlet is perceived by some residents of downstream communities as potentially having a negative impact on future development of their communities, due to the transfer of downstream transfer of floodwaters. It is unlikely that the constrained Pelican Lake outlet would have significant adverse effects on downstream communities. This outlet would be operated specifically to avoid adverse water quality and flooding effects.

The constrained outlet could have negative impacts on lakeside communities if the lake keeps rising despite the outlet. The dashed expectations could potentially be more detrimental to community vitality than never having an outlet.

Community Growth/Development: Expanded Infrastructure

The expansion of infrastructure around the lake would likely have a significant impact on the growth or development of some communities around the lake. For example, a portion of the community of Saint Michael on the southern shore of the lake is currently protected by a road-as-levee. The installation of a new levee to replace this protection would greatly improve the prospects for growth and development of this community by reducing the risk of inundation if the road embankment failed.

Community Growth/Development: Upper Basin Storage

No significant impacts on the growth or development of communities in the watershed are expected to result from increasing upper basin storage. However, upper basin storage could improve the prospects of lakeside communities and downstream communities along the Sheyenne River if it was selected as the best plan to control lake levels.

Community Growth/Development: Physical Features and Construction

Construction activities associated with the alternative plans would likely improve the prospects of some communities for growth and development. For example, the City of Minnewaukan and the City of Devils Lake would likely benefit from the influx of jobs and funds associated with construction activities. The increased activity, suggesting new money coming into the community and solution of the community problems, would enhance the ability of affected communities to retain young people, create jobs, and attract new investments.

Community Cohesion

Communities are groups of people bound together by something held in common - family, culture, ethnic origin, age, gender, religion, political beliefs or locality. “Community cohesion” is a concept that is difficult to grasp, much less to measure, and it can hold different meanings for different people. For the purposes of this assessment, however, “community cohesion” refers to

people's sense of belonging to, and participation within, their local community; and to how the with and without conditions evaluated herein may affect these factors.

The cohesion of a community can be an important determinant of its ability to respond to adversity. Community cohesion is affected by controversy, which is often be engendered by large-scale problems (such as flooding) and by attitudes towards proposed solutions to those problems (such as are being evaluated in this document). Community cohesion can depend on the scale of the community considered. For instance, people that live in the Devils Lake area and those that live downstream along the Sheyenne River are bound by state and national citizenship. They may also be bound by a common concern about problems associated with Devils Lake levels. However, their sense of community cohesion may be adversely affected when certain solutions to Devils Lake problems are proposed. "Upstream" and "downstream" groups may coalesce around their perceptions of the problem and their support or opposition to certain solutions. Even around the lake, there are different communities, divided geographically and ethnically, each with their own perspective. For instance, Native Americans on the Fort Totten Indian Reservation may differ with residents of the City of Devils Lake regarding what are the appropriate solutions to the Devils Lake flooding problem.

Community Cohesion: Further Rise of Lake Level

There appears to be a general consensus within the communities around the lake that an outlet is needed to control lake levels. This consensus if reflected in State of North Dakota and Congressional support for an outlet. However, some Native Americans on the Fort Totten Indian Reservation do not share this perspective, maintaining that the lake should be allowed to fluctuate naturally. As a result, there is a lack of cohesion within the Tribe about the best solution to problems of Devils Lake flooding.

Some communities around the lake have also struggled with decisions regarding FEMA buyouts. Buyouts provide the benefits of flood risk reduction to individual homeowners and businesses, but can seriously disrupt (or in the case of Churchs Ferry) result in the destruction of a community. Individual decisions are complicated by risk perception of the rising lake, perceived fairness of the buyout price, and community responses to buyout proposals. According to some Minnewaukan residents, there has been some community dissent regarding the best solutions for the city. Those favoring buyouts are viewed as surrendering by those who wish to stay and fight for structural solutions to the rising lake levels. The lack of consensus on this issue complicates individual and group decision making about many issues, and can lead to rifts within communities and between community members.

Community Cohesion: Overflow to the Sheyenne River

Downstream along the Sheyenne River there appears to be strong community support for the belief that an overflow from Devils Lake should be prevented. However, there are a variety of perspectives regarding the potential for an overflow to occur. The perceived probability of overflow is a critical factor shaping perceptions of downstream residents regarding the most appropriate solutions to Devils Lake flooding problems.

Community Cohesion: Pelican Lake Outlet

There is less cohesion among communities along the Sheyenne River regarding an outlet from the lake. Some residents of downstream communities believe that an outlet would have deleterious effects on their communities by shifting flooding problems from the lake communities to them. This group of people tends to support increased basin storage as the solution to the rising lake, thereby eliminating need for an outlet. Other downstream residents support a Devils Lake outlet. Many outlet supporters believe that the risk of a natural overflow and the damage it would cause is great enough that a controlled outlet would benefit them; others are sympathetic to lakeside communities facing flooding problems around Devils Lake. As a result of these diverse perspectives, there is some dissension in downstream communities regarding the acceptability an outlet from Devils Lake.

Community Cohesion: Expanded Infrastructure

The expansion of infrastructure around the lake is not expected to have significant impacts on community cohesion. The roads-as-levees are recognized as performing a function for which they were not designed or constructed. There seems to be consensus that new levees would be required to replace roads-as-levees if the lake continues to rise and if an outlet is not constructed.

Community Cohesion: Upper Basin Storage

Increasing upper basin storage is not expected to affect community cohesion with the exception of dissension that may be engendered between those who favor and oppose an outlet as the preferred solution.

Community Cohesion: Physical Features and Construction

The physical features and construction activities associated with the alternative plans are not expected to influence community cohesion beyond the effects cited above.

Land Use/Long-Term Productivity

The alternative plans can affect land use in the study area by changing the physical, social, or economic suitability of land for a particular purpose. The P&G defines the long-term productivity effects as the maintenance and enhancement of the productivity of resources, such as agricultural land, for use by future generations. It is anticipated that the most significant land use changes would occur around Devils Lake in response to lake level fluctuations.

Land Use/Long-Term Productivity: Further Rise of Lake Level

The two most prominent changes include the inundation of lakeside property and land use controls associated with FEMA floodplain management requirements as part of the NFIP. Since the lake began to rise in 1993, the area of the lake has expanded from 70 to over 200 square miles. This has of course affected the area inundated, but it has also affected other lands through secondary effects, including destinations for relocating populations and lands perceived at risk

from future lake rises. If Devils Lake continues to rise to its overflow elevation of 1,460 asl, the area of the lake would expand to 304,000 acres, or 475 square miles.

Regarding FEMA's impacts on land use around the lake, the agency urged Ramsey and Benson counties and the City of Devils Lake to adopt (i.e., endorse) permanent land use ordinances establishing conservation easements that prohibit new construction below 1,460 feet asl in exchange for the NFIP waiver allowing structures to be moved before inundation. After much deliberation, Ramsey County decided not to adopt the ordinance, but Benson County and the City of Devils Lake decided to implement the ordinance with minor adjustments. There are an estimated 45 people in Benson County who qualify for the flood insurance endorsement and waiver.

Some local protective measures around the lake have entailed small land use changes. For instance, the levees to protect the City of Devils Lake have converted the land use, but the footprints of the levees and associated access roads do not occupy a significant amount of land.

Land Use/Long-Term Productivity: Overflow to the Sheyenne River

The overflow route from Devils Lake down Tolna Coulee is approximately 14 miles. Assuming a 50-foot width of the overflow, approximately 85 acres in the coulee would be directly affected. An overflow is not expected to affect land use along or downstream along the Sheyenne River. It is anticipated that flooding associated with an overflow would be contained in the existing floodplain of the Sheyenne River.

Land Use/Long-Term Productivity: Pelican Lake Outlet

The Pelican Lake outlet would affect land use along the outlet route, approximately 133 acres along its 22-mile route. The land along the outlet route, which is primarily agricultural, would likely be removed from production either as cropland or pasture as part of the outlet easement. The buried pipeline would minimize impacts on existing land uses.

Other potential effects of an outlet on land use would include impacts downstream associated with higher flows in the Sheyenne River. Higher groundwater levels could prevent tillage of some farmland. Also, higher flows could impact farms that straddle the river by inhibiting stream crossings by farm equipment or livestock, affecting farm operations on both sides of the river.

Land Use/Long-Term Productivity: Expanded Infrastructure

Expanded infrastructure at Devils Lake is not expected to affect land use around the lake with the exception of land needed for the footprints of new levees landward of the roads-as-levees.

Land Use/Long-Term Productivity: Upper Basin Storage

Implementation of the upper basin storage alternative would involve approximately 40,000 acres. Current land use in the depressions has not been established. However, land use in the upper basin counties is overwhelmingly agricultural. Conversion of the depressions to storage would preclude continuation of agriculture on these lands.

Land Use/Long-Term Productivity: Physical Features and Construction

The physical features and construction activities of the alternative plans are expected to result in only minor, temporary land use changes.

Controversy

As stated previously, controversy and community cohesion are closely tied. Controversy in a community indicates the lack of agreement about a certain issue or problem and an emotional intensity that can create long-lasting fractures in a community's social and economic viability and its ability to respond to adversity. The divisive issues surrounding the problems of a rising Devils Lake and potential solutions were discussed above as affecting the cohesion of communities around the lake and communities downstream along the Sheyenne River. The emotional content that converts disagreements into controversy has been supplied by the speed of the lake's recent rise, the uncertainty of the future behavior of the lake, and the pace of decisionmaking to address problems of the rising lake. Any course of action to address the rising lake would involve trade-offs between communities within the lake region and between the diverse stakeholders within those communities. In the context of the controversy, the trade-offs are perceived by many as creating winners and losers. The geographical separation of some of these communities (e.g., lakeside and downstream communities) fuels and facilitates the controversy by allowing the groups of communities to distinguish themselves as "us" or "them." This often results in "Not In My Back Yard" (NIMBY) responses where people recognize the need for action but actively resist solutions they perceive as negatively affecting them.

Underlying much of the controversy is the uncertainty of the science of climate prediction and hydrologic modeling. There can be no definitive answers to questions regarding how high the lake will go, the likelihood of an overflow, or the water quality effects of an outlet. The fuzziness of the science can be used to support or reject a scientific conclusion according to the perspective of the individual.

One of the purposes of the NEPA process is to fully disclose the potential features and effects of alternatives and to provide a process and forum for full expression (and, hopefully, resolution) of divergent viewpoints. As such, the project public involvement and scoping processes required by NEPA frequently provide the best expression of the level and extent of public controversy. The reader is therefore referred to the Public Involvement Appendix for a fuller expression of public attitudes regarding the Devils Lake project.

Ultimately, it must be recognized that the problems and potential solutions at Devils Lake are highly controversial, and are likely to remain so. The NEPA process is unlikely to dispel this controversy, but it should attempt to identify it, so that decision makers at the Federal, state and local levels can be fully informed public perceptions and attitudes. Therefore, the major sources of controversy expressed to date are summarized below.

Controversy: Further Rise of Lake Level

All of the social issues described above and local economic issues described in subsequent sections of this document fuel the considerable level of controversy that surrounds Devils Lake

problems and solutions. Communities around the lake have experienced significant adversity during recent years due to the rapid rise of the lake. Each additional increment of rise produces new calls from these communities to solve the problem, with a current chorus of support for an outlet. The State of North Dakota has responded to the prospect of continuation of the wet cycle and additional rise of the lake by pursuing a temporary outlet from the West Bay through Peterson Coulee. For residents of lakeside communities, development of an outlet is perceived as long overdue, and their frustration grows with any additional delays.

Controversy: Overflow to the Sheyenne River

Those communities potentially affected by an overflow are sympathetic to those affected by the rising lake. Based on interviews with residents of communities along the Sheyenne River, there is common perception that an overflow could be catastrophic. However, many residents of these communities perceive that an overflow is very unlikely. Some members of these communities have adamantly expressed publicly that increased upper basin storage is the solution to the entire problem, and have suggested that this alternative is being dismissed for political, rather than technical, reasons. The controversy reflects their concerns about the consequences of an overflow and their suspicions about the equity of trade-offs in the State's support for an outlet.

Controversy: Pelican Lake Outlet

As described above, issues about an overflow and an outlet are intertwined. There is additional controversy associated with the outlet route through Peterson Coulee. Some landowners along this route have formed the Peterson Coulee Outlet Association to oppose an outlet through the Coulee. They cite upper basin storage as the solution to lake level rise. They also perceive the State of North Dakota as rushing to build an outlet without full consideration of: (1) upper basin storage as a solution and (2) adverse effects on an outlet.

Controversy: Upper Basin Storage

Controversy about upper basin storage appears to be primarily between lakeside communities that desire an outlet and downstream communities (including those on the overflow and outlet routes) who support increased basin storage. However, concerns have also been expressed by landowners in the upper basin regarding this alternative. Specifically, they are concerned about the fairness of compensation for stormwater detention easements on their land.

Controversy: Physical Features and Construction

The controversy surrounding Devils Lake problems and potential solutions does not appear to based on the physical features of the alternatives (beyond those already discussed) or the temporary construction activities associated with the alternatives.

LOCAL ECONOMIC IMPLICATIONS OF PHYSICAL EFFECTS

The local economic issues that could arise from the physical effects of the alternative plans are examined below. The discussions have an organization similar to those addressing social impact evaluation criteria (see Table 26). These discussions serve as a reference for evaluating the local economic implications of the alternative plans, rather than having repetitive discussions as the

multiple with- and without-project conditions are compared. As will be evident, the regional economy surrounding Devils Lake – like the regional social structure – is an interconnected web of economic activity. The economic evaluation criteria are used to identify the pieces of the puzzle and to assess their linkages.

Table 26
Alignment of Alternative Physical Conditions and Local Economic Impact Criteria

	Physical Conditions of Alternative Plans					
Local Economic Impact Evaluation Criteria	**Change in Lake Level Rise**	**Overflow to Sheyenne River**	**Pelican Lake Outlet**	**Expanded Infrastructure**	**Upper Basin Storage**	**Physical Features and Construction**
Environmental Justice – Economic Aspects						
Transportation						
Agriculture						
Energy Resources/Use						
Employment						
Regional Growth						
Business Activity						
Property Values						
Fiscal Effects						
Public Facilities/Services						

In the economic analysis conducted as part of the Devils Lake planning process, the economic effects of the alternative plans have been evaluated from the perspective of National Economic Development (NED) Account. Increases in NED that are associated with an alternative represent increases in the net national output of goods and services resulting from that plan; decreases in NED represent the economic costs of the plan. The principal categories of positive and negative NED effects of the alternatives include:

- Changes in expected flood damages around the lake and downstream along the Sheyenne River and the Red River,
- Changes in costs of flood damage reduction measures (e.g., levees or relocations),
- Changes in the costs of transportation and other infrastructure improvements, and
- Changes in water treatment costs for downstream communities.

The NED analysis does not provide a comprehensive assessment of all of the economic effects of the alternative plans. NED analysis is not intended to do so. As suggested by its name, the NED account is intended to support Federal investment decision making for water resource projects. Therefore, NED analysis takes a national perspective and is more concerned with changes in the total quantity of economic effects (i.e., what are the net costs and net benefits of an action), than with the regional or local distribution of those effects (i.e., who gains and who loses). The Federal water resources agencies have developed rigorous procedures to estimate the NED costs and benefits of alternative plans irrespective of *"...to whomsoever they may accrue."* (P&G, 1983).

State and local governments must also make decisions regarding the economic effects of the problems and potential solutions for Devils Lake. To these units of government, regional and local economic effects are of equal (if not greater) importance in their decision making process. As a full partner with the Federal government in any proposed solution, local units of government (and their citizenry) deserve to have these regional and local economic effects described in an equivalent level of detail.

The Devils Lake EIS provides an opportunity to assess local economic effects that are not captured by the NED analysis. The analysis of local economic effects focuses on changes in income distribution rather than net changes in national income. The alternative plans would have different effects on different locales and different groups in the study area. The local economic analysis attempts to evaluate these diverse effects.

The rising lake has adversely affected many residents around the lake. However, even under the adversity produced by the rising of Devils Lake, there have been some parties that have benefited. For example, the influx of Federal emergency funds to relocate threatened homes, protect the City of Devils Lake, raise threatened roads, provide crisis counseling, and maintain local infrastructure has brought almost one billion dollars in Federal funds into the Devils Lake region. This has provided a significant boost to some elements of the local economy, such as those individuals and enterprises involved in road construction, house moving, or those individuals or enterprises that support these activities with services (e.g., lodging, restaurants, etc.). In addition, the improvement in the Devils Lake fishery associated with lake level rises has benefited the local recreation related industry.

Environmental Justice – Economic Criteria

The previous discussion of environmental justice considered the social aspects of this issue, focusing on the potential for minority populations to be affected by the alternative plans for

Devils Lake. This section continues the environmental justice analysis, considering economic aspects of this issue, specifically potential effects of the alternative plans on low-income and minority populations. The intent is to determine whether low-income populations in the study area would bear a disproportionate burden under the with- or without-project conditions. As previously, discussions of the economic aspects of environmental justice are organized in accordance with the physical effects of the alternative plans.

Table 27 presents 1997 median household income for the counties in the Devils Lake study area (consistent with Table 4) and the percentage of county population with incomes below the poverty level. The poverty threshold is dependent on family size. In 2000, the threshold for an average family of four was $17,603. Tract-level income data from the 2000 Census are not yet available. For this reason, county-level income data are used for the environmental justice analysis.

Table 27
Populations in Poverty
by County
1997
($2001)

Impact Zone	County	Median Household Income - 1997	Population in Poverty - 1997
Upper Basin	Towner	$27,205	14.8%
	Cavalier	$31,223	12.9%
Lake Area	Benson	$21,833	28.7%
	Ramsey	$30,355	14.8%
	Nelson	$25,831	11.1%
Downstream, ND	Eddy	$26,181	13.0%
	Griggs	$28,108	14.4%
	Steele	$32,659	12.9%
	Barnes	$29,588	13.9%
	Ransom	$32,823	9.6%
	Richland	$36,591	11.4%
	Cass	$38,871	9.0%
	Traill	$35,162	10.9%
	Grand Forks	$35,959	11.2%
	Walsh	$29,847	14.5%
	Pembina	$34,875	10.4%
Downstream, MN	Clay	$37,711	12.5%
	Norman	$29,518	13.9%
	Polk	$32,126	14.3%
	Marshall	$30,975	11.6%
	Kittson	$31,221	12.2%
North Dakota		$31,764	12.5%
Minnesota		$41,591	8. 9%
United States		$37,005	13.3%

Source: Economic Census. 1997.

Environmental Justice (Economic)Lake Level Changes

As indicated in Table 27, most of the counties have incomes and poverty levels that are consistent with state (North Dakota) and U.S. averages. Benson County is an exception with a median income well below state and national averages and more than 28 percent of the county population living in poverty. Benson County is located on the south side of the lake and is home to the Fort Totten Indian Reservation. As discussed previously, tribal representatives have indicated that all structures below 1,460 feet asl have been relocated to higher ground, and further lake rise should not result in significant structural damage to properties in the reservation. Therefore, any further lake level rises would not result in disproportionate economic impacts on low income groups.

Environmental Justice (Economic): Overflow to the Sheyenne River

As indicated in Table 27, the downstream counties in North Dakota and Minnesota, which would be affected by a Devils Lake overflow, have incomes and poverty levels that are consistent with their state and the U.S. averages. Therefore, disproportionate economic impacts on low income and minority groups are not expected.

Environmental Justice (Economic): Pelican Lake Outlet

As indicated in Table 27, the downstream counties in North Dakota and Minnesota, which would be affected by a Devils Lake outlet, have incomes and poverty levels that are consistent with their state and the U.S. averages. Therefore, disproportionate economic impacts on low income and minority groups are not expected.

Environmental Justice (Economic): Expanded Infrastructure

As indicated in Table 27, most of the lake area counties, which would be affected by expanded infrastructure, have incomes and poverty levels that are consistent with state (North Dakota) and U.S. averages. Therefore, disproportionate economic impacts on low income and minority groups are not expected in these areas. However, as discussed above, Benson County is a exceptionally low in terms of median income and relatively high in terms of percentage of county population living in poverty. The construction of levees landward of the road-as-levees could affect Native Americans disproportionately. Some of the lands currently protected by the roads-as-levees are located in the Fort Totten Indian Reservation, particularly in the vicinity of St. Michael. The resolution of 2000 Census data does not permit accurate alignment with areas potentially impacted by the expanded infrastructure alternative. While the overall impacts of this alternative on resident populations may be small, there is potential that Native Americans may be disproportionately affected.

Environmental Justice (Economic): Upper Basin Storage

As indicated in Table 27, most of the upper basin counties, which would be affected by upper basin storage, have incomes and poverty levels that are consistent with state (North Dakota) and U.S. averages. Therefore, disproportionate economic impacts on low income and minority groups are not expected in these areas. The reduction in flood threat provided by upper basin storage should provide positive economic benefits to the low income and minority populations of Benson County.

Environmental Justice (Economic): Physical Features and Construction

The lake area counties are most likely impacted by the physical features of the alternative plans or by construction activities. As discussed above, most of the lake area counties, with the exception of Benson County, have incomes and poverty levels that are consistent with state (North Dakota) and U.S. averages. All efforts would be made during construction to avoid any short-term economic effects on low income and minority populations. Low income and minority populations may actually benefit during the construction process through the provision of construction jobs and multiplier effects of expenditures in the local economy.

Transportation

The alternative plans have the potential to significantly impact transportation in the study area. It is anticipated that most of the transportation effects would be limited to areas around the lake.

Transportation: Lake Level Changes

As discussed previously, some roads around Devils Lake would be inundated by further lake rise. Some roads would probably be abandoned, such as Grahams Island Road and Woods Rutton Road. Decisions about other roads would raise the issues of roads serving as levees with some resolution needed for the impasse between the Department of Transportation and the Corps. Other issues previously discussed include additional travel time around the lake, potholes created by construction vehicles, dust and other visibility problems, and aesthetic issues. Those transportation effects that could be quantified were included in the NED analysis. Others have been qualitatively discussed in the previous sections devoted to social impacts of the alternative plans.

Rail lines around Devils Lake are not anticipated to be significantly affected by implementation of the alternative plans. Some of the lines are no longer in use, such as the Red River Valley and Western Railroad line from the south to Minnewaukan and the Canadian Pacific Railroad line from the City of Devils Lake west to Harlowe. As part of the without-project condition, the track along the Burlington Northern line that runs parallel to US Highway 2 is being raised three feet to at least 1460 feet asl. There are several other rail lines that are spur lines whose main function is to provide service to collect grain from local grain elevators and deliver fertilizer, such as the Burlington Northern Railroad line from Churchs Ferry north to Cando. A rising lake could lead to closure of this line, which would necessitate truck transportation of crops and fertilizer. This would have an adverse effect on those farms currently served by these rail lines

with consequent reduction in farm incomes. These effects are also accounted for in the NED economic analysis.

As part of the without-project condition, the Devils Lake Regional Airport is not considered subject to inundation by further lake rise. The installation of the levee to protect the City of Devils Lake required loss of approximately 150 feet of airport runway. An additional 200 feet of runway was added to the other end. The airport is now protected by the levee and would continue to be protected under assumptions made for the without-project future conditions.

Transportation: Overflow to the Sheyenne River

An overflow of Devils Lake down Tolna Coulee could impact local roads along the overflow route. It could also induce flooding along the Sheyenne River with consequent damage to transportation infrastructure, including roads and bridges.

Transportation: Pelican Lake Outlet

No significant transportation effects are anticipated with implementation of the Pelican Lake outlet, other than those associated with changing lake levels and construction activities.

Transportation: Expanded Infrastructure

The expanded infrastructure alternative would reduce or remove hydraulic pressure on lakeside embankments for roads serving as levees. As previously discussed, this would increase safety of motorists along these roads and maintain transportation along these routes.

Transportation: Upper Basin Storage

Upper basin storage is not expected to significantly affect transportation in the lake area.

Transportation: Physical Features and Construction

Construction activities for any of the alternatives could significantly affect the volume of traffic along access routes during the construction period. Heavy construction vehicles could adversely impact roadways, increasing local maintenance costs along these routes.

Agriculture

Given the rural location of Devils Lake, the alternative plans could have significant impacts on agriculture in the study area. Potential impacts include: (1) inundation of lakeside agricultural lands and (2) reduced water quality in the Sheyenne River and Red River, which serve as sources of irrigation water.

Agriculture: Lake Level Changes

Approximately 166,000 acres would be inundated by the lake's continued rise to its overflow elevation (estimated using elevations 1,445 feet asl and 1,460 feet asl). The vast majority of this land is agricultural. Most of the land at risk lies in Ramsey County (105,000 acres, or 63

percent), followed by Benson County (31,000 acres, or 19 percent), Towner County (25,000 acres, or 15 percent), and Nelson County (5,000 acres, or three percent). The NED analysis estimated flood damages from further lake level rise using the average cost per acre for farmland in the respective counties. While this measure captures the economic effects of farmland inundation from the national perspective, it does not reflect local economic impacts. To do this requires a profile of agriculture around the lake and the expected effects on the local economy of taking farmland out of production.

Agriculture in Ramsey, Benson, and Towner counties are profiled in Table 28 based on information contained in the 1997 Census of Agriculture. The three counties have a similar agricultural profile. The average farm size (in acres) are similar: Ramsey 1,254; Benson 1,255; Towner 1,332. The per-acre market value of land and buildings are also similar: Ramsey $391, Benson $320, Towner $376. Wheat, barley, and sunflower are the most popular crops by acreage, with wheat dominant. There are also some significant differences between agriculture in the three counties. One difference is the number of farms engaged in cattle production. In Benson County, 49.5 percent of farms raise cattle; in Ramsey County 16.2 percent of farms raise cattle; and in Towner County 24.5 percent raise cattle. The market value of livestock (and poultry) sold in Benson ($10.7 million) greatly exceeds that of Ramsey County ($2.7 million) and Towner County ($2.9 million). This may be one explanation for the higher net cash return on agricultural sales per farm in Benson County ($6,511) than in Ramsey County (-$1,085) or in Towner County ($4,203).

Table 28 also contains agricultural information for Ramsey County from the 1987 and 1992 Censuses. This time series of data illustrates the depressed state of the agricultural economy in North Dakota. In particular, the 1987, 1992, 1997 net cash return per farm was $2,636, $28,600, and -$1,085, respectively. This suggests that the majority of farms lost money in 1997. Anecdotal evidence indicates that little, if any, improvement has occurred since 1997. Farming costs (crops and livestock) exceeded returns at a loss rate of $0.87/acre (i.e., $51,085/1,254 acres). The squeeze on farm profitability is the result of steadily increasing costs of farm inputs (see Table 28) and an erosion of commodity prices. As illustrated in Table 29, from 1993 to 2000, indexed prices (national) received for food grains declined 14 percent, and prices for meat animals declined six percent during the same period.

The farm economy in the Devils Lake area is in a depressed condition that results from low commodity prices. In *Regional Economic Effects of Proposed Devils Lake Outlet,* Leistritz et al (1999) developed 10-year average crop budgets for spring wheat, barley, and durum in the Devils Lake region. Again, the depressed condition of the North Dakota farm economy was evident. Per-acre operating losses were estimated for the following crops: spring wheat cultivation (-$17.55 per acre); durum (-$17.90 per acre); sunflowers (-$7.18 per acre). Barley was profitable at $17.90 per acre.

Table 28
Agricultural Profile
Lakeside Counties

	Ramsey County			Benson County	Towner County
	1987	**1992**	**1997**	**1997**	**1997**
Number of Farms	633	511	525	604	428
Land in Farms (acres)	723,306	639,709	658,108	758,199	570,058
Average Size of Farms	1,143	1,252	1,254	1,255	1,332
Farms by Size: 1-9 acres	19	10	7	8	8
Farms by Size: 10-49 acres	22	22	30	20	20
Farms by Size: 50-179 acres	41	30	46	75	42
Farms by Size: 180-499 acres	97	58	94	113	50
Farms by Size: 500-999 acres	154	139	97	103	81
Farms by Size: > 1000 acres	300	252	251	285	227
Total Cropland (acres)	655,910	585,434	450,796	601,095	499,187
Harvested Cropland (acres)	448,740	451,614	450,796	478,033	409,742
Cattle and Calves – Farms	124	105	85	299	105
Beef Cow – Farms	102	88	78	273	98
Milk Cows – Farms	9	6	3	15	2
Hogs & Pigs – Farms	14	19	18	15	5
Sheep & Lambs – Farms	6	10	8	20	8
Corn for Seed or Grain – Acres	1,810	953	1,999	5,030	125
Corn for Silage – Acres	769	1,351	791	2,203	n.a.
Wheat for Grain – Acres	260,059	289,148	206,973	237,435	238,262
Barley for Grain – Acres	90,812	94,087	118,944	88,934	94,112
Oats for Grain – Acres	3,867	1,946	3,490	10,452	3,949
Sunflower Seed – Acres	54,992	40,219	60,630	62,752	17,885
Hay-alfalfa, Grass Silage, Green Chop – Acres	11,943	14,709	10,276	53,686	10,317
Avg. Market Value of Land & Buildings per farm	$369,235	$454,947	$503,726	$412,178	$524,111
Avg. Market Value of Land & Buildings per acre	$331	$349	$391	$320	$376
Total Market Value of Agric. Products ($1,000)	$38,315	$50,740	$44,935	$49,972	$42,394
Market Value of Agric Products Sold per Farm	$60,529	$99,295	$85,590	$82,735	$90,052
Mkt. Value of Crops Sold ($1,000)	$35,370	$47,693	$42,196	$39,217	$39,460
Market Value of Livestock & Poultry Sold ($1,000)	$2,945	$3,046	$2,739	$10,755	$2,935
Total Farm Production Expenses ($1,000)	$35,785	$36,749	$45,112	$46,331	$40,076
Total Farm Production Expenses per farm	$56,443	$71,773	$85,928	$76,706	$93,635
Net Cash Return from Ag. Sales: Avg. Per Farm	$2,636	$28,600	-$1,085	$6,511	$4,203

Source: Census of Agriculture. U.S. Bureau of the Census.

Table 29 Index of Prices Received – U.S. Relative to 1990-1992 Average Food Grains & Meat Animals	
Food Grains (1990-1992 Index = 100)	
1993	105
1994	119
1995	134
1996	157
1997	128
1998	103
1999	90
2000	86
Meat Animals (1990-1992 Index = 100)	
1993	100
1994	90
1995	85
1996	87
1997	92
1998	79
1999	83
2000	94

Source: U.S. Dept of Agriculture, Agricultural Prices, 2000 Summary.

Further rise of Devils Lake would put additional pressure on the regional farm economy by taking more land out of production. Incomes of farmers whose properties are affected would decline, and their patronage of local agriculture-related enterprises for equipment and crop inputs would be reduced. Impacts on farm income were included in the NED analysis. Although the current negative rate of return in Ramsey County would imply that taking cropland out of production via lake inundation would result in a benefit of reduced farm losses, this would not be expected over the 50-year period of analysis. The local economic effects associated with reduced local farm expenditures can be approximated by applying average farm expenditures from Table 28 to the number of acres inundated per Figure 8. The 1992 Devils Lake Reconnaissance Report estimated that lands subject to inundation by the lake between elevations 1,450 to 1,455 feet asl have the following uses: cropland (40 percent), pasture (35 percent), and other (25 percent). Similarly, flooded land between 1,455 and 1,460 feet asl was estimated at: cropland (50 percent), pasture (30 percent), and other (20 percent). Using these land use distributions, the lost annual farm expenditures (crop and pasture) associated with a lake level rise to 1,460 asl would be approximately $9 million.

Using information contained from the 1997 Census of Agriculture for Ramsey County and from Leistritz et al (1999), it is possible to estimate the per-acre rate of return for pasture for beef cattle. With 24,166 acres of pastureland in the County and 6,124 cattle and calves, there are an

estimated 3.9 acres per cow/calf. Using the statewide estimate of Leistritz et al (1999) of approximately $42 of profit per cow, this would result in approximately $10.77 of profit per acre for livestock. Further rise of Devils Lake would be expected to reduce farm income by this amount for each acre of pasture flooded. Similarly, Leistritz et al (1999) also estimated $47 of expenditures per cow, resulting in reduced spending on farm inputs of approximately $185 per acre.

Based on the Wet Future climate scenario hydrologic modeling results in Table 18, lake levels under with- and without-project conditions could eventually fall during the 50-year period of analysis as the wet cycle concludes.

Although falling lake levels could expose land that was previously farmed, it is unlikely that such lands would be productive for many years. The land might be useful for pasture after five to ten years, but it would not be suitable for cultivation for a longer period due to adverse flooding effects on soils, particularly salinity and wave effects.

Agriculture: Overflow to the Sheyenne River

An overflow through Tolna Coulee would effectively eliminate the agricultural potential of lands along the overflow route. Assuming a 14-mile length and a 50-foot width, approximately 85 acres of agricultural land would be affected. In addition, farms that withdraw water from the Sheyenne River or the Red River for irrigation could suffer reduced crop yields associated with the lower river water quality that results from an overflow. These effects on irrigated agriculture are included in the NED analysis. Also, higher flows in the Sheyenne River could affect some farms along the river. Some agricultural property could be damaged from increased flooding, including lands, equipment, and structures.

Also, some farms straddle the river and utilize shallow fords to move livestock or farm equipment from one side of the river to the other. These river crossings may be impeded or prohibited by additional river flow associated with an overflow.

Agriculture: Pelican Lake Outlet

The Pelican Lake outlet would affect agricultural lands in a narrow corridor along the outlet routes, approximately 133 acres along their 22-mile route. The impacts would be minimized by the burial of the pipeline along much of its length. As in the case of an overflow, farms that withdraw water from the Sheyenne River or the Red River for irrigation could suffer reduced crop yields associated with the lower river water quality associated with an outlet. Exacerbated flooding in the Sheyenne River could damage agricultural property, including lands, equipment, and structures. Also, higher flows in the river could affect some farms that straddle the river as described above. These river crossings may also be impeded or prohibited by increased river flows resulting from outlet discharges.

Agriculture: Expanded Infrastructure

The agricultural effects anticipated to result from implementation of expanded infrastructure would include the loss of farmland associated with the footprints of new levees and inundation of lands currently protected by the roads-as-levees.

Agriculture: Upper Basin Storage

Agricultural production in the upper basin would be decreased in the storage areas. Farmers would be directly compensated for these losses through flowage easements, but there may be uncompensated secondary and indirect losses in the local economy due to lower farm related expenditures. Upper basin storage may also result in higher water tables. Farm productivity has been reduced during the current wet cycle by excessive moisture and salt migration into the root zone with higher water tables. It is expected that this condition could be exacerbated to some degree by greater stormwater retention in the watershed.

Agriculture: Physical Features and Construction

The physical features or construction activities of the alternative plans are not expected to have additional effects on agriculture beyond those discussed above.

Energy Resources/Use

The alternative plans are expected to have modest implications for energy consumption in the study area. The most significant effect would be associated with operation of the outlet pumps.

Energy Resources/Use: Lake Level Changes

Further rise of the lake might require additional road construction that could imply higher fuel consumption due to longer commutes around the lake, and additional energy consumption associated with construction activities.

Energy Resources/Use: Overflow to the Sheyenne River

An overflow to the Sheyenne River is not expected to have significant impacts on energy production or consumption.

Energy Resources/Use: Pelican Lake Outlet

The outlet pumps would require significant energy to operate. The pumping station would require installation of a high-voltage line to the facility.

Energy Resources/Use: Expanded Infrastructure

Expanded infrastructure is not expected to have significant impacts on energy production or consumption.

Energy Resources/Use: Upper Basin Storage

Upper basin storage is not expected to have significant impacts on energy production or consumption.

Energy Resources/Use: Physical Features and Construction

Construction of any of the alternative would require energy consumption to operate the construction vehicles. However, this is not expected to result in a significant increase in energy consumption in the area, even during the construction period.

Employment

The alternative plans would have significant effects on employment in the study area. Much of these effects would be experienced in Ramsey or Benson counties as a direct result of construction and operation and maintenance (O&M) of the plan facilities. Estimation of the net employment effects of the alternatives is complicated by (1) job creation anticipated to accompany the without-project conditions, (2) the types of jobs created, (3) short-term and long-term employment effects, and (4) secondary employment effects as economic impacts of the alternative plans ripple through the regional economy via multiplier effects.

Both without-project conditions (Overflow and No Overflow) would result in significant increases in local employment. Further lake level rise would induce demolition or relocation of more homes as well as additional infrastructure work on levees, roads, and municipal systems (i.e., water supply). Some of this job creation would not occur with implementation of the alternative plans, depending on the effectiveness of the alternative in preventing further lake level rise.

The jobs created or lost under the different with- and without-project conditions are not necessarily equal. For example, construction of an outlet may require more skilled workers than additional road raisings or levee construction.

In addition, the effects on employment of the alternative plans may differ in time as well as in number. For example, O&M required for an outlet may require significantly greater manpower than O&M for the expanded infrastructure or upper basin storage alternatives.

Finally, the secondary employment effects of the alternative plans would likely differ. The economic effects of the alternatives would echo through regional economy via multiplier effects and affect employment levels. These effects include primary impacts, such as construction expenditures, and secondary impacts, such as recreation or tourism effects.

Employment: Lake Level Changes

Most of the employment effects of the alternative plans would be manifested in the Devils Lake area. Based on employment data in Table 5 and Table 6, employment in lakeside counties seems to be unaffected by the rise of Devils Lake. However, further lake level rise may have negative effects on employment due to high lake levels and consequent impacts on the local farm economy.

In *Regional Economic Effects of Proposed Devils Lake Outlet,* Leistritz et al (1999) assessed the regional economic effects of an outlet, including employment impacts, using a regional input-output model. The modeling of regional economic effects by Leistritz et al (1999), including those on employment, will be discussed in the following section on regional growth.

Employment: Overflow to the Sheyenne River

An overflow to the Sheyenne River is not expected to have significant employment effects. However, employment could be affected by the high lake levels associated with an overflow.

Employment: Pelican Lake Outlet

The potential employment effects of an outlet as evaluated by Leistritz et al (1999) will be described in the following section as part of the regional economic effects.

Employment: Expanded Infrastructure

The potential employment effects of expanded infrastructure as evaluated by Leistritz et al (1999) will be described in the following section as part of the regional economic effects.

Employment: Upper Basin Storage

Increased upper basin storage is not expected to have significant employment effects.

Employment: Physical Features and Construction

The potential employment effects of construction activities associated with an outlet as evaluated by Leistritz et al (1999) will be described in the following section as part of the regional economic effects.

Regional Growth

In *Regional Economic Effects of Proposed Devils Lake Outlet,* Leistritz et al (1999) identified four sectors that serve as the engines of the Devils Lake regional economy: agriculture, Federal activities, tourism, and manufacturing (see Table 8 and Table 9). The sectors' relative shares of final demand in the region in Leistritz et al (1999) was based on 1996 economic data: agriculture (48.3 percent), Federal activities (38.2 percent), tourism (10.2 percent), and manufacturing (3.3 percent). It is likely that since 1996 these relative shares have changed significantly but perhaps not permanently. For example, the depressed condition of the agricultural economy has likely further reduced its share. In addition, the 1996 share of Federal activities does not reflect the almost one billion dollars of Federal emergency spending since 1993 in response to the rise of Devils Lake. Finally, tourism in the region has increased significantly as the lake has risen, largely as a result of improved fishing and hunting conditions described previously. Although these changes are potentially significant, they are not necessarily permanent. Looking out over the 50-year period of analysis, it is likely that agriculture will rebound at some point and that Federal emergency spending will subside as problems with the lake are addressed. It is likely that tourism in the lake area will continue to grow, given national trends of disposable income and leisure time. Current and future tourism will be discussed in a subsequent section on business activity.

Despite hard times in the agricultural economy, farming continues to be the principal engine of the regional economy. Leistritz et al (1999) used their regional input-output model to evaluate the regional economic effects of two stochastic traces of lake levels: Trace 10, which represents

a likely future situation (i.e., the without-project condition), and Trace 498, which represents a best case situation for effects of an outlet (i.e., with-project condition). Their model simulated regional economic activity for both traces with the effects of an outlet being the differences between the modeled runs for the traces. Their analysis considered the regional economic effects of the with- and without-project conditions over the 50-year period of analysis and considered construction and O&M expenditures, as well as home relocations, transportation improvements, and agricultural production that would accompany lake level fluctuations. Leistritz et al (1999) concluded that the regional economic effects of a Devils Lake outlet are relatively small compared to the size of the regional economy. Their analysis anticipated that an outlet would result in: (1) a net loss of business volume (approximately $8.8 million) in the near term due to the home relocations and infrastructure protection that would no longer be required and (2) a net gain in gross business volume (approximately $24.9) in the long term due to increased agricultural activity associated with less farmland inundation. The employment estimates mirror those for gross business volume with a net loss of jobs (approximately 108) in the near term and a net gain in jobs (approximately 284) in the long term. The scale of effects are small (i.e., less than two percent) relative to a regional economy estimated to have $789.5 million in final demand for region goods and services and employment of over 16,000 jobs.

Anticipating that the effects of an outlet on the regional economy would be relatively small does not necessarily dismiss the issue of regional growth in consideration of the effects of the alternative plans. The effects on the regional economy may be disproportionately realized in specific sectors or locations. For example, there is widespread anecdotal evidence that road construction in response to the rise of Devils Lake has had adverse effects on shopping activity in the City of Devils Lake. The effects on the regional economy may be small, since shoppers affected by the construction can shop elsewhere in the region. However, the regional economy could be weakened by injury to its retail core located with the City. More discussion of changes in business activity is provided in a subsequent section of this document.

Regional Growth: Lake Level Changes

As described above, most of the effects of the alternative plans on the regional economy would be realized in the area surrounding Devils Lake. However, these effects would be small. Agriculture is the principal engine of the regional economy. New infusions of Federal spending in response to further lake rise would stimulate the economy in the short term, but the long-term effects would be modest.

Economic development officials in the Devils Lake area report that the uncertainty associated with the lake has made it more difficult to attract new enterprises to the area. The perceived risk of the rising lake, which has received national media attention, may be a deciding (negative) factor for firms looking to relocate or expand.

Regional Growth: Overflow to the Sheyenne River

An overflow to the Sheyenne River is not expected to influence the growth potential for economies of downstream communities.

Regional Growth: Pelican Lake Outlet

As described in discussions of the work of Leistritz et al (1999), the effects of an outlet on regional growth are expected to be small.

Regional Growth: Expanded Infrastructure

As implied by the work of Leistritz et al (1999), the effects of expanded infrastructure on regional growth are expected to be small.

Regional Growth: Upper Basin Storage

As implied by the work of Leistritz et al (1999), the effects of upper basin storage on regional growth are expected to be small.

Regional Growth: Physical Features and Construction

As discussed by Leistritz et al (1999), construction-related effects are expected to be one of the principal impacts on the regional economy. However, even the economic effects of construction are not expected to exceed two percent of total regional gross business activity or employment.

Business Activity

As discussed in the previous section, from the perspective of the regional economy surrounding Devils Lake, the implementation of the alternative plans are expected to have a relatively small impact. Nevertheless, the location and character of business activity within the region may be significantly changed by the alternative plans. Looking forward through the 50-year period of analysis, the location and character of business activity in the Devils Lake area will be shaped by a variety of social and economic influences, including agriculture, tourism, Federal spending, and to a lesser extent the expansion and contraction of Devils Lake.

Business Activity: Lake Level Changes

The most important issue regarding business activity in the Lake area involves the health of the retail sector in the City of Devils Lake. As indicated in Table 47, the City (as part of Ramsey County) serves as the retail hub for the Lake region. The economic vitality of the City of Devils Lake is critical to the social and economic future of the region for several reasons. First, access to the City's retail sector provides an important amenity for Lake area residents. Preservation and expansion of such amenities is one of the best hopes to slow or reverse the depopulation of rural portions of the study area. Second, the retail sector is the core of the City economy. The jobs that are created by this sector are critical to the economy of the City and the region. The positive prospects created by employment in this economic hub is another important means to promote the social and economic vitality of the lake area.

The current condition of the City economy is clouded by contrary influences. The City economy has been under pressure from the depressed condition of the farm economy. The loss of farmland to the rising lake has exacerbated the drag of this sector on the regional economy. In addition, City officials report that the rise of Devils Lake and the transportation impacts in

particular have had a very deleterious impact on the City's retail sector. City merchants report that regional shopping patterns have been affected in recent years by the rising lake. Many shoppers from the southern areas around the lake have discontinued their patronage of City stores due to the additional travel and inconvenience resulting from road construction. In addition, economic development officials in Devils Lake indicate that retail chains are reluctant to invest in the City of Devils Lake given the uncertainty of the lake's level and the consequent risk to the City's economic vitality.

Despite these negative developments, the City economy as a whole has done relatively well in recent years. Table 48 presents taxable sales for the City of Devils Lake and surrounding cities with competitive retail establishments. The table indicates that the City continues to serve as the retail hub of the Lake region. City officials maintain that this is a false economy created by the influx of almost $1 billion in Federal emergency funds in the last 10 years for road construction, home relocations, and other responses to the rising lake. Federal spending has undoubtedly stimulated the local economy. However, tourist visitation to the lake region has significantly increased with the expansion of the lake due to improved hunting and fishing conditions. As indicated by Leistritz et al. (1999), the importance of tourism to the lake area economy is growing. As estimated by Brooks and Hiltner (1999), fishermen spend up to $28 million per year in the Devils Lake area. Nonresidents account for seven percent of open water fishing and 21 percent of ice fishing, and they spend approximately $230/day to fish on Devils Lake (Lewis et al, 1998).

To determine the balance of these diverse influences on the City economy would require detailed surveys of City shoppers and restaurant and motel patrons, as well as surveys of merchants in the City. These surveys are beyond the scope of this investigation. However, several conclusions can be drawn regarding the future of business activity in the City and the potential effects of the alternative plans on:

TABLE 30
Taxable Sales
Lakeside Counties
1992-2000

County	1992	1993	1994	1995	1996	1997	1998	1999	2000
Benson	$7,236,829	$8,077,925	$9,831,376	$8,813,524	$10,027,204	$7,908,742	$7,152,638	$8,142,774	$8,238,232
	% change*	11.6%	21.7%	-10.4%	13.8%	-21.1%	-9.6%	13.8%	1.2%
Nelson	$18,867,792	$19,252,863	$20,258,309	$18,256,928	$19,481,155	$19,809,214	$16,694,426	$16,355,813	$14,503,036
	% change*	2.0%	5.2%	-9.9%	6.7%	1.7%	-15.7%	-2.0%	-11.3%
Ramsey	$96,747,557	$102,751,955	$112,093,435	$110,989,182	$112,747,567	$112,588,825	$111,056,932	$115,617,747	$119,110,465
	% change*	6.2%	9.1%	-1.0%	1.6%	-0.1%	-1.4%	4.1%	3.0%

* Change from Preceding Year
Source: North Dakota Sales and Use Tax Statistical Report. Office of State Tax Commissioner, Annual Reports: 1992-2000

TABLE 31
Taxable Sales of Selected Cities
Devils Lake Area
1992-2000

City	County	1992	1993	1994	1995	1996	1997	1998	1999	2000
Cando	Towner	$6,129,270	$6,368,212	$7,241,785	$6,408,657	$7,119,785	$6,309,938	$6,578,879	$6,842,034	$6,591,777
	% change*		3.9%	13.7%	-11.5%	11.1%	-11.4%	4.3%	4.0%	-3.7%
Carrington	Foster	$23,770,042	$28,920,062	$32,569,919	$28,681,434	$30,010,334	$29,066,629	$27,971,937	$29,872,683	$30,045,889
	% change*		21.7%	12.6%	-11.9%	4.6%	-3.1%	-3.8%	6.8%	0.6%
Devils Lake	Ramsey	$92,645,548	$98,695,489	$108,164,903	$107,508,079	$109,203,436	$109,441,096	$108,250,650	$112,268,818	$115,938,456
	% change*		6.5%	9.6%	-0.6%	1.6%	0.2%	-1.1%	3.7%	3.3%
Fessenden	Wells	$4,252,372	$4,681,563	$4,874,380	$4,337,344	$3,944,635	$4,172,439	$4,718,414	$4,841,996	$5,123,532
	% change*		10.1%	4.1%	-11.0%	-9.1%	5.8%	13.1%	2.6%	5.8%
Leeds	Benson	$3,268,719	$3,245,967	$4,338,053	$3,674,018	$4,955,260	$2,842,435	$1,969,371	$1,987,828	$2,066,256
	% change*		-0.7%	33.6%	-15.3%	34.9%	-42.6%	-30.7%	0.9%	3.9%
Maddock	Benson	$2,328,662	$3,011,835	$3,386,203	$2,992,589	$2,998,491	$3,240,515	$3,223,636	$3,271,351	$3,669,100
	% change*		29.3%	12.4%	-11.6%	0.2%	8.1%	-0.5%	1.5%	12.2%
Minnewaukan	Benson	$213,098	$253,129	$321,669	$305,485	$242,874	$332,068	$203,351	$186,085	$226,541
	% change*		18.8%	27.1%	-5.0%	-20.5%	36.7%	-38.8%	-8.5%	21.7%
New Rockford	Eddy	$4,572,001	$5,145,621	$5,624,336	$5,594,151	$6,139,036	$6,405,080	$6,068,070	$6,024,015	$6,696,705
	% change*		12.5%	9.3%	-0.5%	9.7%	4.3%	-5.3%	-0.7%	11.2%
Rugby	Pierce	$26,557,195	$33,899,289	$38,502,682	$37,994,869	$34,801,740	$31,839,849	$29,670,154	$27,727,571	$29,365,777
	% change*		27.6%	13.6%	-1.3%	-8.4%	-8.5%	-6.8%	-6.5%	5.9%

* Change from Preceding Year
Source: North Dakota Sales and Use Tax Statistical Report. Office of State Tax Commissioner, Annual Reports: 1992-2000.

1) Business activity in the City will be constrained by any continuation of dismal conditions in the farm economy.

2) Tourist spending in the City will continue to increase in accordance with national standards of disposable income and leisure time and would experience additional stimulation by further rise of the lake.

3) Shoppers from the south side of the lake will likely resume their patronage of City establishments unless further lake rises threaten lakeside roads, perpetuating problems with road-as-levees as previously discussed.

4) The uncertainty associated with an uncontrolled and potentially threatening lake will continue to have adverse effects on future economic development in the City.

Business Activity: Overflow to the Sheyenne River

An overflow of Devils Lake through Tolna Coulee is not expected to have significant impacts on business activity in the lake area or downstream along the Sheyenne River.

Business Activity: Pelican Lake Outlet

An outlet from Devils Lake would promote economic development in the City of Devils Lake and stimulate business activity by reducing uncertainty and risks to commercial enterprises associated with rising lake levels. An outlet would also help restore regional shopping patterns that allowed the City to serve as retail center for areas south of the lake.

Business Activity: Expanded Infrastructure

Installing levees landward of the roads-as-levees would help promote the return of shoppers from south of the lake to the City of Devils Lake by reducing risks and disruptions associated with travel on these roads.

Business Activity: Upper Basin Storage

Increasing upper basin storage may have some positive effects on business activity through modest effects on lake levels and through construction expenditures. However, these positive effects could be offset by reduced agricultural expenditures due to lost farmland, as discussed previously.

Business Activity: Physical Features and Construction

The construction of any of the alternative plans would temporarily stimulate business activity in the Lake area and in the City of Devils Lake as the economic hub of the area.

Property Values

The alternative plans could potentially affect property values around Devils Lake, in the upper basin, and downstream along the Sheyenne River and Red River. As will be discussed below,

effects on property values are mixed with positive impacts in some locations and negative impacts in another.

Property Values: Lake Level Changes

As the lake has risen in recent years, property values in inundated areas and areas threatened with inundation have decreased. However, there is anecdotal evidence that some areas in the City of Devils Lake have experienced increased property values as a result of housing demand by dislocated lakeside residents. For those residential areas subject to inundation by further rise of the lake, there is downward pressure on their property values. For those areas already inundated, their value has been greatly diminished, and the adoption of conservation easements on some properties as part of the FEMA waivers have reduced the future value of those properties even in the event of a recession of the lake. For those upland areas around the lake, their property value has been enhanced.

The agricultural property values contained in Table 32 suggest that per-acre pasture and cropland values in lakeside counties have continued to increase during the lake's rise. The increase in value is somewhat surprising given the depressed condition of the regional agricultural economy in recent years.

Table 32
Agricultural Property Values (per acre)
Lakeside Counties

	Cropland (nonirrigated)		Pasture (nonirrigated)	
County	**Average 1992-1996**	**1997**	**Average 1992-1996**	**1997**
Benson	$307	$356	$136	$164
Nelson	$349	$370	$146	$181
Ramsey	$356	$377	$170	$194

Source: *Economics Database Update for the Lands and Developments Feasibility Study*.

The rise of Devils Lake appears to be reflected in the decrease in agricultural acreage in Benson and Ramsey counties in Table 33. In both counties the taxable values of agriculture have been increasing despite a decrease in agricultural acreage, reflecting the increase in per-acre value in Table 28.

It has been reported that relocated houses have higher property values after their move due to improvements made as part of the relocation and the removal from exposure to the rising lake. In addition, the rising lake has in some cases reduced the aesthetics of some residential properties, as levees or raised roads block views, or road access is diminished.

The prospect of further lake rise should recreate these mixed effects on property values. A falling lake should improve valuation of areas subject to inundation by providing an additional buffer. However, the exposed lands would probably not regain their former value due to the

occurrence of inundation, the damages resulting from inundation, and conservation easements that restrict future redevelopment of these previously vacated lands.

TABLE 33
Taxable Property
Lakeside Counties

County & Property Type	1998	1999	2000
Benson County			
Agriculture - acres	786,878	785,774	783,550
Agriculture - taxable value	$9,151,818	$9,118,470	$9,358,463
Residential - taxable value	$933,022	$954,482	$972,326
Commercial - taxable value	$634,518	$636,018	$645,875
Nelson County			
Agriculture - acres	615,059	615,011	615,029
Agriculture - taxable value	$8,050,342	$8,213,636	$8,303,224
Residential - taxable value	$1,013,827	$1,025,802	$1,034,981
Commercial - taxable value	$720,974	$720,322	$674,526
Ramsey County			
Agriculture - acres	729,120	728,642	728,253
Agriculture - taxable value	$9,553,568	$9,421,848	$9,768,585
Residential - taxable value	$6,446,899	$6,645,488	$6,942,880
Commercial - taxable value	$4,886,980	$4,950,887	$5,141,197

Source: Job Service North Dakota

Property Values: Overflow to the Sheyenne River

An overflow from Devils Lake through Tolna Coulee could diminish property values along the overflow route and downstream along the Sheyenne River and perhaps along the Red River. Flood damages to property and to the riparian zone would be the principal cause of lower property values. Properties affected would be limited to those lands in the floodplain.

Property Values: Pelican Lake Outlet

An outlet from Devils Lake could reduce property values along the Sheyenne River. The potential for adverse impacts to property values would be based on damage the riparian zone, exacerbated flood risks, and reduced water quality for agriculture or recreation. Properties affected would be limited to those lands along the river. An outlet could diminish property values along the outlet route by: 1) reduced agricultural use of those lands, 2) requisite access to maintain the outlet facilities, or 3) reduced aesthetics.

Property Values: Expanded Infrastructure

Expanded infrastructure could have mixed effects on property values behind roads-as-levees. For those areas between the roads and new levees, their inundation would greatly reduce their

value. However, for those areas behind the new levees, their protection from future inundation could significantly increase their value.

Property Values: Upper Basin Storage

No significant effects on property values in the upper basin are anticipated to result from enhanced storage.

Property Values: Physical Features and Construction

Construction of an alternative plan could temporarily reduce the value of nearby properties.

Fiscal Effects

The alternative plans could have significant fiscal effects on state, county, and local governments in the study area. Potential impacts include changes in tax receipts and expenses of local governments. A brief history of the funding of responses to rising lake levels can be used to anticipate fiscal effects of the alternative plans.

Expenditures In Response to the Rising Lake

As discussed previously, most of the home relocations or abandonments were conducted under the National Flood Insurance Program, administered by FEMA. HUD administered relocations on the Fort Totten Indian Reservation. These programs do not require local funding matches. As a result, the fiscal impacts of home relocations on local government were limited to those associated with sales and property taxes.

There were significant impacts associated with local flood protection. Specifically, the levee protecting the City of Devils Lake was constructed by the Corps in the 1980s to an elevation of 1,445 feet asl. In 1996, the levee was raised under emergency authorities to 1,450 feet asl. In 2000, the levee was raised again to 1,457 (providing a level of protection to 1,450 asl). The initial construction by the Corps was conducted with a 60 percent Federal / 40 percent non-Federal cost share. The City took full responsibility for the non-Federal share. The first raise of the levee was conducted with a 75 percent Federal / 25 percent non-Federal cost share. Again, the City took full responsibility for the non-Federal share. The second raise of the levee, which cost approximately $43 million, was also performed with a 75 percent Federal / 25 percent non-Federal cost share. In this case, the City was able to draw upon other funding sources to meet the non-Federal share ($10.8 million), primarily the Community Development Block Grants (CDBG) of HUD.

In addition to providing much of the non-Federal share of the levee construction, the City of Devils Lake has incurred a variety of other expenditures in response to the rising lake. These include extensive storm sewer modifications and water supply protection. The City is planning to develop a new water supply source using its own funds. In addition, the installation of the levee required relocation of a portion of the runway of the Devils Lake Regional Airport. The City provided the non-Federal share for the runway modifications.

The City of Minnewaukan has also had significant expenditures in response to the rising lake. The City was able to use CDBG funds to provide the non-Federal share to relocate its sewer system. However, the City used its own funds to conduct a variety of road and sewer repairs. The City of Minnewaukan has spent approximately $300,000 to respond to the lake's rise.

The fiscal impacts of the rising lake on Benson County and on Ramsey County have been associated with raising threatened county roads. The county governments have provided the non-Federal share of emergency road construction performed by the Federal Highway Administration. The State of North Dakota has similarly matched road construction on state roads around the lake, including State Routes 57, 20, 19, and 2. For Hazard Mitigation Projects such as the buyout of Churchs Ferry, there is a 25 percent non-Federal cost share. The non-Federal shares for such projects around Devils Lake have been divided by the county and the state using 15 percent / 10 percent shares, respectively.

Changes in Tax Revenues

Most of the counties in the study area derive their tax receipts from property taxes. The states and most of the cities in the study area derive their tax receipts from sales taxes. For Benson County and Ramsey County, property taxes on inundated residential and agricultural lands have been reduced to levels of nonproductive land, such as wetlands. However, the total taxable value of property in these counties have increased per Table 51.

As indicated in Table 53, sales tax receipts of the City of Devils Lake have risen in recent years, consistent with the increase in taxable sales per Table 51. As discussed previously, the changes in sales taxes in this table may be part of a false economy stimulated by the temporary influx of Federal emergency funds. The City of Minnewaukan has also experienced increases in taxable sales during the lake's rise (see Table 48).

Table 34
Sales Tax Receipts
City of Devils Lake
1992-2000

1992	$746,321
1993	$754,121
1994	$807,576
1995	$845,777
1996	$890,586
1997*	$1,266,315
1998	$1,359,759
1999**	$1,456,927
2000	$1,365,818

Source: City of Devils Lake
* 1.5% tax enacted Feb 1997 (1% prior)
** Last two weeks of Dec 99 tax included in Jan 2000

Additional fiscal pressure has been placed on the City of Devils Lake by a 2001 reduction in its municipal bond rating. This rate reduction was in response to uncertainty associated with the effects of lake levels on the City's finances. The result is that borrowing money for municipal projects has become more expensive.

Fiscal Effects: Lake Level Changes

If the lake continues to rise, county and local governments around the lake may again face increased local expenditures to respond to the lake and downward pressure on tax revenues. Levee protection for the City of Devils Lake to 1,460 feet asl has been estimated to cost $150 million. The funding sources for the non-Federal share for another levee raise are not clear, but the State of North Dakota has reportedly committed to providing the full non-Federal share.

If the lake was to recede, local governments around the lake would receive some diminution of their fiscal pressures on expenditures and revenues. However, they would still need to pay off debt for previous expenditures. In the case of Devils Lake, the reduced influx of Federal dollars may expose the false economy of recent years, and sales tax revenues could suffer.

Fiscal Effects: Overflow to the Sheyenne River

An overflow from Devils Lake through Tolna Coulee could have adverse fiscal effects on communities downstream along the Sheyenne River. These communities could be forced to make road and bridge repairs if local infrastructure is damaged by flooding that could result from an overflow.

Fiscal Effects: Pelican Lake Outlet

An outlet from Devils Lake would not be expected to have significant fiscal effects on communities downstream along the Sheyenne River. However, an outlet could result in positive fiscal effects on lakeside counties and cities, as discussed above, assuming that the State of North Dakota would provide the non-Federal share of outlet costs.

Fiscal Effects: Expanded Infrastructure

Expanded infrastructure could have some fiscal effects on local governments by inundating areas currently protected by roads-as-levees with consequent reductions in property tax revenues to county governments. It is assumed that the State of North Dakota would provide the non-Federal share of outlet costs.

Fiscal Effects: Upper Basin Storage

There may be some fiscal effects associated with conversion of agricultural lands to storage. It is assumed that the State of North Dakota would provide the non-Federal share to implement the upper basin storage alternative.

Fiscal Effects: Physical Features and Construction

There may be a temporary increase in sales tax revenues associated with construction expenditures.

Public Facilities/Services

As discussed previously, the alternative plans could affect transportation, water supply, and wastewater infrastructure. The creeping onset of the rising lake has allowed sufficient time to modify public infrastructure around the lake. The principal issue is the cost of modifications and who bears this financial burden.

Public Facilities/Services: Lake Level Changes

The rising lake has disrupted a variety of public infrastructure systems around Devils Lake. Stormwater systems in the City of Devils Lake have required extensive modification in response to the lake's rise. Sanitary sewers in the City of Devils Lake, the City of Minnewaukan, and areas served by the Ramsey County Rural Utilities have been disrupted. Ramsey County Rural Utilities has lost approximately one-third (220 customers) of its customer base. The rising lake has squeezed this utility between higher expenditures (with higher debt service) and a smaller customer base. Some local governments have come to the support of the utility. For instance, in 2001 Creel Township committed to pay for half of a project to provide protection for Ramsey County Rural Utilities' sewer system, which services about 70 homes in the Lakewood neighborhood.

The City of Devils Lake's water supply source is located on high ground south of Tokio in Benson County. The City's water supply line has been inundated by the lake's rise. Due to potential maintenance and repair difficulties, the City is currently pursuing new water supply sources on the north side of the lake.

Further rise of Devils Lake would create additional pressure on utilities and other public facilities and services. However, many actions taken to date in response to the lake's rise have protected critical facilities from further lake rise.

Public Facilities/Services: Overflow to the Sheyenne River

An overflow of Devils Lake through Tolna Coulee is not expected to impact public facilities or services beyond those previously discussed.

Public Facilities/Services: Pelican Lake Outlet

An outlet from Devils Lake is not expected to impact public facilities or services beyond those previously discussed.

Public Facilities/Services: Expanded Infrastructure

Construction of levees landward of the roads-as-levees is not expected to impact public facilities or services beyond those previously discussed.

Public Facilities/Services: Upper Basin Storage

Enhanced upper basin storage is not expected to impact public facilities or services beyond those previously discussed.

Public Facilities/Services: Physical Features and Construction

Construction activities associated with implementation of the alternative plans are not expected to impact public facilities or services beyond those previously discussed.

SOCIAL AND LOCAL ECONOMIC EFFECTS OF DEVILS LAKE ALTERNATIVES

The economic and social effects of the Devils Lake alternatives are presented below. The with- and without-project conditions are explicitly compared using the social and local economic evaluation criteria. Each comparison of with- and without-project conditions has been summarized in an evaluation matrix. There are six matrices, evaluating the three with-project conditions (i.e., Pelican Lake outlet, upper basin storage, or expanded infrastructure) relative to two without-project conditions (i.e., Overflow and No Overflow).

The matrices contain scores assigned to the social and local economic evaluation criteria. The assigned scores reflect anticipated social and local economic effects of the alternative plans based on the physical effects relative to without-project conditions. In many cases, an alternative plan could have positive and negative effects with respect to the same evaluation criteria, depending on the location and point in time over the 50-year period of analysis. Numerous uncertainties are embedded in expectations of the physical effects of the alternative plans. These uncertainties are compounded by uncertainties in the interpretation of the secondary effects on the community and local economy. In many cases, professional judgment was used to collapse these considerations into the assigned score.

Concise discussions explain the rationale behind the assigned scores for each of the evaluation criteria. To avoid repetition, the discussions are summaries of social and local economic issues expected to accompany the with- and without-project futures. The reader is encouraged to revisit previous discussions of the issues to more fully comprehend the balance of positive and negative effects of the alternative plans to address flooding problems at Devils Lake.

For the overflow without-project condition, the physical effects are based on the Wet Future climate scenario analyses of lake levels, outlet discharges, and downstream effects. The hydrologic performance of the alternative plans under the Wet Future is summarized in Table 17. For the No Overflow without-project condition, the physical effects are based on the stochastic analyses of lake levels, outlet discharges, and downstream effects, which are summarized in Table 16. Under this without-project condition, lake levels would be expected to rise significantly over the 50-year period of analysis (but not enough to overflow).

The with- and without-project comparisons will be presented in the following sequence:

- Pelican Lake outlet and Overflow without-project condition,
- Pelican Lake outlet and No Overflow without-project condition,
- Upper basin storage and Overflow without-project condition,
- Upper basin storage and No Overflow without-project condition,

- Expanded infrastructure and Overflow without-project condition, and
- Expanded infrastructure and No Overflow without-project condition.

Table 35
Assessment of Net Impacts
With-Project Condition: Constrained Pelican Lake Outlet
Without-Project Condition: Overflow

Social & Economic Evaluation Criteria	Magnitude of Anticipated Impact (–) ◄---► (+)						
	Adverse Effects			No Effect	Positive Effects		
	Significant	Substantial	Minor		Minor	Substantial	Significant
Social Effects							
Population Relocation							✓
Environmental Justice - Social					✓		
Public Health							✓
Public Safety							✓
Noise levels			✓				
Aesthetic Values						✓	
Recreation						✓	
Community Growth/Development							✓
Community Cohesion						✓	
Land Use/Productivity							✓
Controversy						✓	
Local Economic Effects							
Environmental Justice - Economic					✓		
Transportation						✓	
Agriculture						✓	
Energy Resources/Use			✓				
Employment					✓		
Regional Growth						✓	
Business Activity						✓	
Property Values						✓	
Fiscal Effects						✓	
Public Facilities/Services						✓	

With Project Condition: Constrained Pelican Lake Outlet
Without-Project Condition: Overflow

The following discussions explain scores assigned in Table 35, which compares the Pelican Lake outlet to the Overflow without-project condition over the 50-year period of analysis.

SOCIAL EFFECTS

- **Population Relocation:** By reaching an overflow elevation, the Overflow without-project condition could induce significant relocation of population around the lake and downstream along the Sheyenne River. As indicated in Table 17, under the Wet Future climate scenario, Devils Lake could experience very high lake levels even with the constrained Pelican Lake outlet. Consequently additional relocations around the lake would be expected under these extreme hydrologic conditions. However, the outlet would prevent an overflow and would therefore have significant positive effects in this category by preventing population relocations in areas downstream along the Sheyenne River. It is unlikely that the outlet would induce relocation of population along the outlet route. Despite relocations anticipated around the lake and perhaps along the outlet route, the net population relocation effects of the outlet are expected to be very positive.

- **Environmental Justice – Social:** On the Fort Totten Indian Reservation most of the structures at risk from higher lake levels have been relocated to higher ground. As a result, high lake levels associated with the Overflow without-project condition are expected to have modest adverse effects on the reservation, primarily by inundating pasture land. The Pelican Lake outlet is not expected to disproportionately affect minority populations (in this case Native Americans) either through construction or operation of the outlet. Under the Wet Future climate scenario, implementation of the Pelican Lake outlet would result in some reduction in lake levels relative to the without-project condition. Consequently, the outlet is expected to have minor positive effects in terms of environmental justice (social) relative to the Overflow without-project condition.

- **Public Health:** The Overflow without-project condition could create significant adverse health effects as lake levels rise to the overflow elevation. Based on experience with the lake rise in recent years, adverse health effects would include: anticipatory stress, chronic wet basements, access to health care, and effects on school-age children. Some or all of these effects could accompany the Pelican Lake outlet, since the lake would continue to rise under the Wet Future climate scenario even after installation of the outlet (see Table 17). However, the emotional boost of an outlet, perceived around the lake as the best solution, could provide emotional support to deal with those problems. Residents downstream along the Sheyenne River would avoid much of the anxiety associated with an imminent overflow, as expected under the Wet Future climate scenario. Despite health problems associated with further rise of lake levels, the net health effects of the outlet are expected to be very positive.

- **Public Safety:** The Overflow without-project condition could have significant safety impacts around the lake and downstream. Safety risks include driving hazards

associated with high lake levels relative to lakeside roads and with potential failure of roads-as-levees. The constrained Pelican Lake outlet would somewhat reduce lakeside safety issues and, more importantly, would prevent the overflow expected under the Wet Future climate scenario (see Table 17). Consequently, the net effect of the outlet is expected to be significantly positive.

- **Noise Levels:** The Overflow without-project conditions could entail significant noise impacts, primarily with continued road raisings and house relocations in response to the rising lake. Under the Wet Future climate scenario, lake levels with an outlet would also be very high (see Table 17), and lakeside noise levels would be similar to the without-project condition. However, the construction and operation of the outlet would generate additional noise effects, which would be temporary and permanent, respectively. While the noise effects of the outlet are expected to be negative relative to the without-project condition, the overall effects are expected to be minor due to the rural character of potential noise impact areas.

- **Aesthetic Values:** An overflow from Devils Lake could significantly reduce the aesthetics of the Sheyenne River. Under the Wet Future climate scenario, lakeside aesthetic impacts of the without-project condition and the Pelican Lake outlet are expected to be similar due to high lake levels. However, the Pelican Lake outlet would prevent an overflow (see Table 17), and the adverse aesthetic effects downstream of an overflow would be avoided. The outlet might have some adverse effects on the aesthetics of the Sheyenne River by accelerating erosion and deposition processes. In sum, the Pelican Lake outlet is expected to have substantial positive aesthetic effects relative to the Overflow without-project condition.

- **Recreation:** The Overflow without-project condition would result in substantial negative effects on recreation along the Sheyenne River. Under the Wet Future climate scenario, high lake levels expected with the Overflow without-project condition and with the Pelican Lake outlet would be generally positive for recreation on the lake. While fishing is improved by lake level rise, recreation access can be adversely affected. The outlet would not have a large effect on lake levels under the Overflow condition, but it would prevent an overflow (see Table 17), avoiding adverse recreation effects along the Sheyenne River. The net effect of the outlet relative to the Overflow condition is expected to be substantially positive due to avoided adverse recreation effects on the Sheyenne River.

- **Community Growth/Development:** The Overflow without-project condition would have significant negative effects on community growth/development on lakeside communities due to high lake levels and to adverse effects of an overflow on downstream communities. Under the Wet Future climate scenario, Devils Lake would also experience high lake levels despite installation of the constrained Pelican Lake outlet (see Table 17). However, the outlet would reduce the amount of lake level rise and would prevent an overflow. Consequently, the outlet is expected to have significant positive effects relative to the Overflow condition.

- **Community Cohesion:** The Overflow without-project condition would be accompanied by a low level of community cohesion. During the rise of the lake, lakeside communities would conflict with downstream communities. Lakeside communities would call for an outlet; some downstream communities would resist an outlet due to perceived adverse effects on the Sheyenne River and Red River. If an overflow was imminent, downstream resistance to an outlet would subside somewhat due to the prospect of uncontrolled discharge. However, many downstream residents do not consider an overflow to be imminent and perceive upper basin storage to be a neglected solution to the rise of the lake. The outlet would have minor positive effects by uniting lakeside communities and by limiting conflict with downstream communities through operational constraints. The net effects of the Pelican Lake outlet relative to the Overflow condition is expected to be substantially positive. There will be some downstream resistance to the outlet unless an overflow is impending, and downstream residents will continue to identify upper basin storage as the solution to the Devils Lake problem.

- **Land Use/Productivity:** The Overflow without-project condition would have significant negative effects on land use/productivity, since it would be accompanied by high lake levels. In addition, the overflow could also adversely affect land use/productivity in downstream communities. Under the Wet Future climate scenario, Devils Lake would also experience high lake levels despite installation of the constrained Pelican Lake outlet (see Table 17). However, the outlet would reduce the amount of lake level rise and would prevent an overflow. A constrained outlet would limit discharges downstream and consequent adverse effects. Consequently, the outlet is expected to have significant positive effects relative to the Overflow condition.

- **Controversy:** The Overflow without-project condition would inflame controversy in lakeside communities by not addressing flooding problems around Devils Lake. Lakeside residents would perceive this inaction negatively and blame the individuals or groups perceived to be responsible. The prospect of an overflow would create additional controversy downstream regarding upper basin storage as the preferred alternative of many downstream residents. The Pelican Lake outlet would reduce controversy around the lake, but it could increase controversy downstream. The net impact of the Pelican Lake outlet relative to the Overflow without-project condition is expected to be substantially positive.

LOCAL ECONOMIC EFFECTS

- **Environmental Justice – Economic:** On the Fort Totten Indian Reservation most of the structures at risk from higher lake levels have been relocated to higher ground. Elsewhere in Benson County there are some structures at risk from rising lake levels. Given the high poverty rate in this county, some of these structures may house low-income residents. The high lake levels associated with the Overflow without-project condition could inundate a small number of low-income residents outside the reservation, as well as pasture land on the reservation. Under the Wet Future climate scenario, the Pelican Lake outlet would also be accompanied by high lake levels (see Table 17) but to a lesser extent than the without-project condition. The implementation of the Pelican Lake outlet is also not expected to have adverse effects on low-income populations, either

along the outlet route or downstream along the Sheyenne River. As a result, it is anticipated that the Pelican Lake outlet would have minor positive effects in terms of environmental justice (economic) relative to the Overflow condition.

- **Transportation:** The Overflow without-project condition would have significant negative effects on transportation around Devils Lake due to high lake levels and on downstream communities due to the uncontrolled discharge from the lake. Under the Wet Future climate scenario, Devils Lake would also experience high lake levels despite installation of the constrained Pelican Lake outlet (see Table 17). Construction of the outlet could also have temporary adverse effects on transportation in the study area. However, the outlet would reduce the amount of lake level rise and would prevent an overflow. Consequently, the outlet is expected to have substantial positive effects on transportation relative to the Overflow condition.

- **Agriculture:** The Overflow without-project condition would have significant negative effects on agriculture around Devils Lake, and the overflow could also adversely affect agriculture downstream. Under the Wet Future climate scenario, Devils Lake would also experience high lake levels despite installation of the constrained Pelican Lake outlet (see Table 17). However, the outlet would reduce the amount of lake level rise and would prevent an overflow. Consequently, the outlet is expected to have substantial positive effects on agriculture relative to the Overflow condition.

- **Energy Resources/Use:** The pumps for the Pelican Lake outlet could require substantial energy to operate. Otherwise, there is expected to be little difference between future conditions with the overflow and with the Pelican Lake outlet. Consequently, the Pelican Lake outlet is expected to have a minor adverse effect on energy resources/use relative to the Overflow condition.

- **Employment:** The high lake levels associated with the without-project conditions may at some point affect employment in the Devils Lake area by taking agricultural land out of production. However, employment in lakeside counties seems to be unaffected by the rise of Devils Lake in recent years. Under the Wet Future climate scenario, the Pelican Lake outlet should result in some reduction of lake levels relative to the without-project condition. There may be some positive short-term employment effects of outlet construction. Consequently, the outlet is expected to result in a minor positive effect on employment relative to the Overflow condition.

- **Regional Growth:** The Overflow without-project condition is expected to have substantial negative effects on regional growth due to inundation of farmland, disruption of regional shopping patterns, and difficulty in attracting new enterprises to the area. The implementation of the Pelican Lake outlet would be expected to result in some positive effects on regional growth. The action to solve this regional problem would provide a psychological boost to the region perhaps inducing new investment, and the expenditure of construction funds in the area would provide some economic stimulus. However, under the Wet Future climate scenario, lake levels with the outlet would still be very high. Consequently, the Pelican Lake outlet is expected to have substantial positive effects on regional growth relative to the Overflow condition.

- **Business Activity:** High lake levels associated with the Overflow without-project condition could have adverse effects on business activity in the Devils Lake area. Under the Wet Future climate scenario, lake levels would still be very high even with implementation of the Pelican Lake outlet. However, as with the above discussion of regional growth, the action to solve this regional problem would provide a psychological boost to the Devils Lake region, and the expenditure of construction funds in the area would provide some economic stimulus. Consequently, the Pelican Lake outlet is expected to have substantial positive effects on business activity relative to the Overflow condition.

- **Property Values:** Further lake rise associated with the Overflow without-project condition would have mixed effects on property values around the lake. However, there would be significant adverse effects on property values downstream along the Sheyenne River. Under the Wet Future climate scenario, the Pelican Lake outlet would be accompanied by high lake levels, but the outlet would prevent an overflow (see Table 17). The net effect of the Pelican Lake outlet on property values is expected to be substantially positive relative to the Overflow condition.

- **Fiscal Effects:** Further lake rise associated with the Overflow without-project condition would have negative fiscal effects on lakeside communities. Higher lake levels would result in decreased tax revenues to and increased expenditures by local governments. There could also be significant adverse fiscal effects on communities downstream along the Sheyenne River. Under the Wet Future climate scenario, the Pelican Lake outlet would be accompanied by very high lake levels, but the outlet would prevent an overflow (see Table 17). The net fiscal effects of the Pelican Lake outlet are expected to be substantially positive relative to the Overflow condition.

- **Public Facilities/Services:** Further lake rise associated with the Overflow without-project condition would have negative effects on public facilities/services. Additional modification of stormwater and wastewater systems around the lake would be required. There could also be significant adverse effects on public facilities/services in communities downstream along the Sheyenne River. Under the Wet Future climate scenario, the Pelican Lake outlet would also be accompanied by high lake levels, but the outlet would prevent an overflow (see Table 17). The net effect of the Pelican Lake outlet on public facilities/services is expected to be substantially positive relative to the Overflow condition.

Table 36
Assessment of Net Impacts
With-Project Condition: Constrained Pelican Lake Outlet
Without-Project Condition: No Overflow

Social & Economic Evaluation Criteria	Magnitude of Anticipated Impact (–) ◄ ► (+)						
	Adverse Effects			No Effect	Positive Effects		
	Significant	Substantial	Minor		Minor	Substantial	Significant
Social Effects							
Population Relocation							✓
Environmental Justice - Social					✓		
Public Health							✓
Public Safety							✓
Noise levels			✓				
Aesthetic Values				✓			
Recreation				✓			
Community Growth/Development						✓	
Community Cohesion				✓			
Land Use/Productivity							✓
Controversy					✓		
Local Economic Effects							
Environmental Justice - Economic					✓		
Transportation						✓	
Agriculture							✓
Energy Resources/Use			✓				
Employment					✓		
Regional Growth						✓	
Business Activity						✓	
Property Values					✓		
Fiscal Effects						✓	
Public Facilities/Services						✓	

With Project Condition: Constrained Pelican Lake Outlet
Without-Project Condition: No Overflow

The following discussions explain scores assigned in Table 36, which compares the Pelican Lake outlet to the No Overflow without-project condition over the 50-year period of analysis.

SOCIAL EFFECTS

- **Population Relocation:** The No Overflow without-project condition would entail further rise of Devils Lake with consequent population relocations around the lake. As indicated by the stochastic analysis of lake levels (see Table 16), the constrained Pelican Lake outlet would significantly reduce lake levels relative to the without-project condition. Although there could be additional lakeside population relocations associated with the constrained outlet and perhaps some minor relocations along the outlet route, it is anticipated that the outlet would have significantly positive effects in terms of population relocation relative to the No Overflow condition.

- **Environmental Justice – Social:** On the Fort Totten Indian Reservation most of the structures at risk from higher lake levels have been relocated to higher ground. The principal effect of additional lake rise would be inundation of pasture land. The constrained Pelican Lake outlet would significantly reduce lake levels relative to the without-project condition (see Table 16). The Pelican Lake outlet is not expected to adversely affect minority populations either through construction or operation. Consequently, the outlet is expected to have minor positive effects in terms of environmental justice (social) relative to the No Overflow without-project condition.

- **Public Health:** Based on experience with the lake rise in recent years, adverse health effects of additional lake rise would include: anticipatory stress, chronic wet basements, access to health care, and effects on school-age children. The Pelican Lake outlet would significantly reduce lake levels relative to the without-project condition (see Table 16). In addition, the emotional boost of an outlet, perceived around the lake as the best solution, could provide emotional support to deal with those problems. As a result, the public health effects of the Pelican Lake outlet are expected to be significantly positive relative to the No Overflow condition.

- **Public Safety:** Additional lake level rise could reduce public safety of motorists traveling around the lake and of residents living behind roads-as-levees. Since the Pelican Lake outlet would significantly reduce lake levels relative to the without-project condition (see Table 16), the net effect of the outlet is expected to be significantly positive.

- **Noise Levels:** Additional rise of Devils Lake could entail significant noise impacts, primarily via continued road raisings and house relocations. As indicated in Table 16, the Pelican Lake outlet would significantly reduce lake levels relative to the without-project

condition. However, the construction and operation of the outlet would generate additional noise effects, which would be temporary and permanent, respectively. While the noise effects of the outlet on the potential rural noise impact areas are expected to be negative relative to the without-project condition, the overall effects are expected to be minor.

- **Aesthetic Values:** Further rise of Devils Lake would be expected to have minor adverse effects on lakeside aesthetic values. As indicated by the stochastic analysis of lake levels in Table 16, the constrained Pelican Lake outlet would significantly reduce lake levels relative to the without-project condition. In addition, outlet releases could potentially have minor adverse effects on aesthetic values along the Sheyenne River. In sum, the Pelican Lake outlet is expected to have neutral aesthetic effects relative to the No Overflow without-project condition.

- **Recreation:** Further rise of Devils Lake would be expected to improve recreation resources on Devils Lake but could also create further difficulties in providing recreation access. Although the constrained Pelican Lake outlet would significantly reduce lake levels relative to the without-project condition, outlet releases could potentially have minor adverse effects on recreation along the Sheyenne River. Overall, the Pelican Lake outlet is expected to have neutral recreation effects relative to the No Overflow without-project condition.

- **Community Growth/Development:** Further rise of Devils Lake would have significant negative effects on growth/development of lakeside communities. The Pelican Lake outlet would be expected to reduce the rate and extent of lake level rise (see Table 16). However, adverse effects of an outlet on downstream communities would limit net positive impacts on the growth/development study area communities. Consequently, the outlet is expected to have substantial positive effects on community growth/development relative to the No Overflow condition.

- **Community Cohesion:** If Devils Lake continues to rise, lakeside communities would increasingly conflict with downstream communities. Lakeside communities would renew calls for an outlet; some downstream communities would resist an outlet due to perceived adverse effects on the Sheyenne River and Red River. The constrained outlet would have minor positive effects by uniting lakeside communities and by limiting conflict with downstream communities (through constrained operations). The net effect of the Pelican Lake outlet relative to the No Overflow condition is expected to be neutral due to downstream resistance to the outlet. Unless an overflow is imminent, downstream residents will continue to identify upper basin storage as the solution to the Devils Lake problem.

- **Land Use/Productivity:** Additional rise of Devils Lake would have significant negative effects on land use/productivity by inundating agricultural land. The Pelican Lake outlet would reduce the extent of lake level rise (see Table 16). Consequently, the outlet is expected to have significant positive effects on land use/long-term productivity.

- **Controversy:** Additional rise of Devils Lake would inflame controversy about the most appropriate solution for this problem. Under the without-project condition, lakeside residents would perceive the inaction negatively and blame the individuals or groups perceived to be responsible. The Pelican Lake outlet would reduce their concerns, but the outlet would create additional controversy with some downstream residents who perceive enhanced upper basin storage as the best solution to the Devils Lake problem. The constrained design and operation of the Pelican Lake outlet would help reduce lakeside and downstream controversy. Consequently, the net impact of the Pelican Lake outlet relative to the No Overflow without-project condition is expected to have minor positive effects.

LOCAL ECONOMIC EFFECTS

- **Environmental Justice – Economic:** On the Fort Totten Indian Reservation most of the structures at risk from higher lake levels have been relocated to higher ground. Outside the reservation in Benson County there are some structures at risk from rising lake levels that may house low-income residents. Rising lake levels could inundate some of these structures, as well as pasture land on the reservation. The Pelican Lake outlet would significantly reduce lake levels relative to the without-project condition (see Table 16). Implementation of the outlet would not have adverse effects on low-income populations, either along the outlet route or downstream along the Sheyenne River. As a result, it is anticipated that the Pelican Lake outlet would have minor positive effects in terms of environmental justice (economic) relative to the No Overflow condition.

- **Transportation:** Additional rise of Devils Lake would have significant negative effects on transportation around the lake primarily due to construction to raise roads threatened with inundation. As indicated in Table 16, the Pelican Lake outlet would significantly limit further lake rise. However, construction of the outlet could also have short-term adverse effects on transportation in the study area. Consequently, the outlet is expected to have substantial positive effects on transportation relative to the No Overflow condition.

- **Agriculture:** Further rise of Devils Lake would have significant negative effects on agriculture around the lake by inundating crop and pasture lands. Reductions in farm income would exacerbate local economic problems associated with a depressed farm economy. Since the outlet would limit the rise of Devils Lake (see Table 16), it is expected to have significant positive effects on agriculture relative to the No Overflow condition.

- **Energy Resources/Use:** The pumps for the Pelican Lake outlet could require substantial energy to operate. Otherwise there is expected to be little difference between the No Overflow conditions and the Pelican Lake outlet. Consequently, the Pelican Lake outlet is expected to have a minor adverse effect on energy resources/use relative to the No Overflow condition.

- **Employment:** Employment in lakeside counties has been largely unaffected by the rise of Devils Lake in recent years. However, the high lake levels associated with the

without-project conditions may at some point affect employment in the Devils Lake area by taking agricultural land out of production. Since the Pelican Lake outlet should limit further rise of Devils Lake, the outlet is expected to result in a minor positive effect on employment relative to the No Overflow condition.

- **Regional Growth:** Further rise of Devils Lake would have substantial negative effects on regional growth due to inundation of farmland, disruption of regional shopping patterns, and difficulty in attracting new enterprises to the area. The implementation of the Pelican Lake outlet would positively affect regional growth. This action to solve the problem of Devil Lake would provide a psychological boost to the region perhaps inducing new investment, and the expenditure of construction funds in the area would provide some economic stimulus. Consequently, the Pelican Lake outlet is expected to have substantial positive effects on regional growth relative to the No Overflow condition. The problems and solutions are relatively small in terms of regional economic significance compared to agriculture.

- **Business Activity:** Additional rise of Devils Lake would exacerbate disruptions of business activity that have occurred in recent years. In particular, regional shopping changes appear to have been at least temporarily altered by transportation impacts of the rising lake. The Pelican Lake outlet would significantly limit additional rise of Devils Lake. As with the above discussion of regional growth, the action to solve this regional problem would provide a psychological boost to the Devils Lake region, and the expenditure of construction funds in the area would provide some economic stimulus. Consequently, the Pelican Lake outlet is expected to have substantial positive effects on business activity relative to the No Overflow condition. Again, the problems and solutions are relatively small in terms of significance for business activity compared to agriculture.

- **Property Values:** Further lake rise would have mixed effects on property values around the lake. By limiting the rise of Devils Lake, the Pelican Lake outlet would result in some improvement in property values. This improvement would be tempered by the outlet's potential to reduce property values downstream along the Sheyenne River. The Pelican Lake outlet is expected to have a net minor positive effect on property values to the No Overflow condition.

- **Fiscal Effects:** Additional rise of Devils Lake would have negative fiscal effects on lakeside communities. Higher lake levels would result in decreased tax revenues to and increased expenditures by local governments. Since the Pelican Lake outlet would significantly limit further rise of the lake, the net effect of the Pelican Lake outlet on fiscal effects is expected to be substantially positive relative to the No Overflow condition. The potential for more positive effects is limited by prior adjustments to lake level rise.

- **Public Facilities/Services:** Further lake rise of Devils Lake negatively effects public facilities/services by necessitating additional modification of stormwater and wastewater systems around the lake. The Pelican Lake outlet would limit additional lake level rise, but there could be significant rise of Devils Lake even with the outlet. Consequently, it is expected that the Pelican Lake outlet would have substantially positive effects on public facilities/services relative to the No Overflow condition.

Table 37
Assessment of Net Impacts
With-Project Condition: Upper Basin Storage
Without-Project Condition: Overflow

Social & Economic Evaluation Criteria	Magnitude of Anticipated Impact (–) ◄ ► (+)						
	Adverse Effects			No Effect	Positive Effects		
	Significant	Substantial	Minor		Minor	Substantial	Significant
Social Effects							
Population Relocation				✓			
Environmental Justice - Social				✓			
Public Health			✓				
Public Safety				✓			
Noise levels				✓			
Aesthetic Values				✓			
Recreation				✓			
Community Growth/Development				✓			
Community Cohesion		✓					
Land Use/Productivity			✓				
Controversy		✓					
Local Economic Effects							
Environmental Justice - Economic				✓			
Transportation				✓			
Agriculture			✓				
Energy Resources/Use				✓			
Employment				✓			
Regional Growth			✓				
Business Activity			✓				
Property Values				✓			
Fiscal Effects				✓			
Public Facilities/Services				✓			

With-Project Condition: Upper Basin Storage
Without-Project Condition: Overflow

The following discussions explain scores assigned in Table 37, which compares enhanced upper basin storage to the overflow without-project condition over the 50-year period of analysis.

SOCIAL EFFECTS

- **Population Relocation:** By reaching an overflow elevation, the Overflow without-project condition could induce significant relocation of population around the lake and downstream along the Sheyenne River. As indicated in Table 17, under the Wet Future climate scenario, Devils Lake could experience very high lake levels and an overflow even with enhanced upper basin storage. Due to the small effect of enhanced upper basin storage on lake levels and overflow potential, this alternative would have no effect on population relocation relative to the Overflow condition.

- **Environmental Justice – Social:** On the Fort Totten Indian Reservation most of the structures at risk from higher lake levels have been relocated to higher ground. As a result, high lake levels associated with the Overflow without-project condition are expected to have modest adverse effects on the reservation, primarily by inundating pasture land. Implementation of enhanced upper basin storage is not expected to adversely affect minority populations. Under the Wet Future climate scenario, enhanced upper basin storage would result in very little reduction in lake levels relative to the without-project condition. Consequently, the outlet is expected to have neutral effects in terms of environmental justice (social) relative to the Overflow condition.

- **Public Health:** The Overflow without-project condition could create adverse health effects via rising lake levels to the overflow elevation, including anticipatory stress, chronic wet basements, access to health care, and effects on school-age children. All of these effects would accompany enhanced upper basin storage, as well. The lake would continue to rise and eventually overflow under the Wet Future climate scenario even with enhanced upper basin storage (see Table 17). Consequently, adverse health effects would be experienced downstream as well as around the lake, as affected populations experience anxiety associated with an imminent overflow. For these reasons, enhanced upper basin storage would be expected to have minor negative health effects relative to the Overflow condition.

- **Public Safety:** The Overflow without-project condition could have significant safety impacts associated with safety issues around the lake and flooding risks downstream. Safety risks include transportation issues associated with traveling around the lake and with potential failure of roads-as-levees. Enhanced upper basin storage would have little effect on lake levels and, more importantly, would not prevent the overflow expected under the Wet Future climate scenario. Consequently, enhanced upper basin storage is expected to have no effect on public safety relative to the Overflow condition.

- **Noise levels:** The Overflow without-project conditions could entail significant noise impacts, primarily with continued road raisings and house relocations in response to the rising lake. Under the Wet Future climate scenario, lake levels with enhanced upper basin storage would also be very high, reaching overflow elevation (see Table 17). Lakeside noise levels would be largely unaffected by enhanced upper basin storage. Construction activities associated with enhanced upper basin storage would have temporary and minimal noise effects, due to the rural locations of suitable depressions. Consequently, enhanced upper basin storage would be expected to have neutral effects on noise levels relative to the Overflow condition.

- **Aesthetic Values:** An overflow from Devils Lake could significantly reduce the aesthetics of the Sheyenne River. Under the Wet Future climate scenario, lakeside aesthetic impacts of the without-project condition and enhanced upper basin storage are expected to be similar, with the storage offering modest reduction in lake levels. Enhanced upper basin storage would not prevent an overflow (see Table 17), and the overflow's adverse aesthetic effects downstream would not be avoided. Consequently, enhanced upper basin storage is expected to have no effect on aesthetic values relative to the Overflow without-project condition.

- **Recreation:** Under the Wet Future climate scenario, high lake levels and ultimate overflow would be expected under the Overflow without-project condition and with enhanced upper basin storage. High lake levels would be positive for recreation on the lake; the overflow would result in substantial negative effects on recreation along the Sheyenne River. Since enhanced upper basin storage would have little effect on lake levels or overflow potential, it is expected to have no effect on recreation relative to the Overflow condition.

- **Community Growth/Development:** The Overflow without-project condition would have significant negative effects on community growth/development on lakeside communities due to high lake levels, and the overflow could also adversely affect downstream communities. Under the Wet Future climate scenario, Devils Lake would also experience high lake levels and an overflow despite enhanced upper basin storage (see Table 17). Consequently, enhanced upper basin storage is expected to have no effect on community growth/development relative to the Overflow condition.

- **Community Cohesion:** The Overflow without-project condition would be accompanied by a low level of community cohesion. During the rise of the lake, lakeside communities would conflict with downstream communities. Some residents of downstream communities would continue their calls for enhanced upper basin storage; lakeside communities would renew their support for an outlet. Implementation of enhanced upper basin storage would please downstream supporters and would dismay outlet proponents, since it would not have the hydrologic performance to solve Devils Lake flooding problems (see Table 17). Under the Wet Future climatic scenario, the lake would rise to overflow elevation with enhanced upper basin storage, lakeside communities would conflict with downstream communities over what should have been done, and downstream communities would have internecine conflict between previous supporters of the an outlet and enhanced upper basin storage. Consequently, enhanced upper basin

storage would result in substantial negative effects on community cohesion relative to the Overflow condition.

- **Land Use/Productivity:** The Overflow without-project condition would have significant negative effects on land use/long-term productivity, since it would be accompanied by high lake levels. In addition, the overflow could also adversely affect land use/long-term productivity in downstream communities. Under the Wet Future climate scenario, Devils Lake would also experience high lake levels and an overflow despite enhanced upper basin storage (see Table 17). In addition, as part of this alternative, some agricultural lands would be converted to impoundments. Consequently, enhanced upper basin storage is expected to have minor negative effects relative to the Overflow condition.

- **Controversy:** The Overflow without-project condition would inflame controversy in lakeside communities by not addressing flooding problems around Devils Lake. Lakeside residents would perceive this inaction negatively and blame the individuals or groups perceived to be responsible. However, implementation of enhanced upper basin storage would please many downstream residents. As indicated in Table 17, Devils Lake would reach overflow elevation with enhanced upper basin storage. The prospect of an overflow would create additional controversy downstream, since some residents would argue that an outlet was required to control Devils Lake levels. In sum, enhanced upper basin storage could increase controversy around the lake and downstream by not controlling lake levels sufficiently to prevent an overflow. Consequently, enhanced upper basin storage would result in substantial negative impacts on controversy regarding Devils Lake relative to the Overflow condition.

Local Economic Effects

- **Environmental Justice – Economic:** On the Fort Totten Indian Reservation most of the structures at risk from higher lake levels have been relocated to high ground. Elsewhere in Benson County there are some structures at risk from rising lake levels. Given the high poverty rate in this county, some of these structures may house low-income residents. The high lake levels associated with the Overflow without-project condition could inundate a small number of low-income residents outside the reservation and pasture land on the reservation. Under the Wet Future climate scenario, enhanced upper basin storage would also be accompanied by high lake levels (see Table 17). The implementation of enhanced upper basin storage is also not expected to have adverse effects on low-income populations. As a result, it is anticipated that enhanced upper basin storage would have no effect in terms of environmental justice (economic) relative to the Overflow condition.

- **Transportation:** The Overflow without-project condition would have negative effects on transportation around Devils Lake due to high lake levels and on downstream communities due to the uncontrolled discharge from the lake. Under the Wet Future climate scenario, Devils Lake would also experience high lake levels despite enhanced upper basin storage (see Table 17). It is expected that enhanced upper basin storage would have no effect on transportation relative to the Overflow condition.

- **Agriculture:** The Overflow without-project condition would have significant negative effects on agriculture around Devils Lake, and the overflow could also adversely affect agriculture downstream. Under the Wet Future climate scenario, Devils Lake would also experience high lake levels and an overflow despite enhanced upper basin storage (see Table 17). Implementation of enhanced upper basin storage would take some agricultural land out of production for use as storage impoundments. Consequently, it is expected that enhanced upper basin storage would have a minor adverse effect on agriculture relative to the Overflow condition.

- **Energy Resources/Use:** Enhanced upper basin storage is not expected to affect energy resources/use in the study area relative to the Overflow condition.

- **Employment:** The high lake levels associated with the without-project conditions may at some point affect employment in the Devils Lake area by taking agricultural land out of production. However, employment in lakeside counties seems to be unaffected by the rise of Devils Lake in recent years. Under the Wet Future climate scenario, enhanced upper basin storage will have little effect on lake levels or overflow potential of Devils Lake. Although construction of the storage impoundments could provide some employment for the region, this alternative would remove some land from productive agricultural use. In sum, enhanced upper basin storage is expected to have neutral effects on employment relative to the Overflow condition.

- **Regional Growth:** The Overflow without-project condition is expected to have substantial negative effects on regional growth due to inundation of farmland, disruption of regional shopping patterns, and difficulty in attracting new enterprises to the area. The implementation of enhanced upper basin storage would result in some positive effects on regional growth. The action to solve this regional problem would provide a psychological boost to the region perhaps inducing new investment, and the expenditure of construction funds in the area would provide some economic stimulus. However, under the Wet Future climate scenario, lake levels with enhanced upper basin storage would still be very high, reaching overflow elevation. Enhanced upper basin storage could diminish economic prospects through unmet expectations of the chosen solution. As a result, enhanced upper basin storage is expected to have minor negative effects on regional growth relative to the Overflow condition.

- **Business Activity:** High lake levels associated with the Overflow without-project condition could have adverse effects on business activity in the Devils Lake area. Under the Wet Future climate scenario, lake levels would still be very high even with enhanced upper basin storage. However, as with the above discussion of regional growth, the action to solve this regional problem could result in a psychological letdown to the Devils Lake region through false expectations of the efficacy of this alternative. Nevertheless, expenditure of construction funds in the area would provide some economic stimulus. In sum, enhanced upper basin storage is expected to have minor negative effects on business activity relative to the Overflow condition.

- **Property Values:** Further lake rise associated with the Overflow without-project condition would have mixed effects on property values around the lake. However, there

would be significant adverse effects on property values downstream along the Sheyenne River. Under the Wet Future climate scenario, enhanced upper basin storage would also be accompanied by high lake levels, culminating in an overflow (see Table 17). Enhanced upper basin storage is expected to have no effect on property values relative to the Overflow condition.

- **Fiscal Effects:** Further lake rise associated with the Overflow without-project condition would have negative fiscal effects on lakeside communities. Higher lake levels would result in decreased tax revenues to and increased expenditures by local governments. There could also be significant adverse fiscal effects on communities downstream along the Sheyenne River. Under the Wet Future climate scenario, enhanced upper basin storage would also result in high lake levels and an overflow (see Table 17). Since enhanced upper basin storage will have little effect on lake levels, this alternative is expected to have no fiscal effects relative to the Overflow condition.

- **Public Facilities/Services:** Further lake rise associated with the Overflow without-project condition would have negative effects on public facilities/services. Further rise of Devils Lake would require additional modification of stormwater and wastewater systems around the lake. There could also be significant adverse effects on public facilities/services in communities downstream along the Sheyenne River. Under the Wet Future climate scenario, enhanced upper basin storage would also allow high lake levels and an overflow (see Table 17). Enhanced upper basin storage is not expected to affect public facilities/services relative to the Overflow condition.

Table 38
Assessment of Net Impacts
With-Project Condition: Upper Basin Storage
Without-Project Condition: No Overflow

Social & Economic Evaluation Criteria	Magnitude of Anticipated Impact (–) ◄——► (+)						
	Adverse Effects			No Effect	Positive Effects		
	Significant	Substantial	Minor		Minor	Substantial	Significant
Social Effects							
Population Relocation				✓			
Environmental Justice - Social				✓			
Public Health			✓				
Public Safety				✓			
Noise levels				✓			
Aesthetic Values				✓			
Recreation				✓			
Community Growth/Development				✓			
Community Cohesion		✓					
Land Use/Productivity				✓			
Controversy		✓					
Local Economic Effects							
Environmental Justice - Economic				✓			
Transportation				✓			
Agriculture			✓				
Energy Resources/Use				✓			
Employment				✓			
Regional Growth			✓				
Business Activity			✓				
Property Values				✓			
Fiscal Effects				✓			
Public Facilities/Services				✓			

With-Project Condition: Upper Basin Storage
Without-Project Condition: No Overflow

The following discussions explain scores assigned in Table 38, which compares enhanced upper basin storage to the No Overflow without-project condition over the 50-year period of analysis.

SOCIAL EFFECTS

- **Population Relocation:** The No Overflow without-project condition anticipates further rise of Devils Lake with consequent population relocations around the lake. As indicated by the stochastic analysis of lake levels (see Table 16), enhanced upper basin storage would have a relatively small effect on lake levels relative to the without-project condition. Due to the small effect of enhanced upper basin storage on lake levels and overflow potential, this alternative would have a neutral effect on population relocation relative to the No Overflow condition.

- **Environmental Justice – Social:** On the Fort Totten Indian Reservation most of the structures at risk from higher lake levels have been relocated to higher ground. The principal effect of additional lake rise would be inundation of pasture land. Enhanced upper basin storage would result in a relatively small reduction in lake levels relative to the without-project condition (see Table 16). Implementation of enhanced upper basin storage is not expected to have adverse effects on minority populations. Consequently, enhanced upper basin storage is expected to have a neutral effect in terms of environmental justice (social) relative to the No Overflow without-project condition.

- **Public Health:** Based on experience with the lake rise in recent years, adverse health effects of additional lake rise would include: anticipatory stress, chronic wet basements, access to health care, and effects on school-age children. Enhanced upper basin storage would result in modest reductions in lake levels relative to the without-project condition (see Table 16). In addition, the emotional boost of action to address the Devils Lake flooding problem could provide emotional support to deal with those problems. However, the poor hydrologic performance of this alternative would limit this positive effect. As a result, enhanced upper basin storage is expected to have minor negative effects on public health relative to the No Overflow condition.

- **Public Safety:** The Overflow without-project condition could have significant safety impacts associated with safety issues around the lake and flooding risks downstream. Safety risks include transportation issues associated with traveling around the lake and with potential failure of roads-as-levees. Enhanced upper basin storage would have little effect on lake levels and, more importantly, would not prevent the overflow expected under the Wet Future climate scenario. Additional lake level rise could reduce public safety of motorists traveling around the lake and of residents living behind roads-as-levees. Since enhanced upper basin storage would have little effect on lake levels relative to the without-project condition (see Table 16), this alternative is expected to have neutral effects relative to the No Overflow condition.

- **Noise levels:** Additional rise of Devils Lake could entail significant noise impacts, primarily via continued road raisings and house relocations. As indicated in Table 16, enhanced upper basin storage would result in modest reductions in lake levels relative to the without-project condition. Lakeside noise levels would be largely unaffected by enhanced upper basin storage. Construction activities associated with enhanced upper basin storage would have temporary and minimal noise effects, due to the rural locations of suitable depressions. Consequently, enhanced upper basin storage would be expected to have neutral effects on noise levels relative to the No Overflow condition.

- **Aesthetic Values:** Further rise of Devils Lake would be expected to have minor adverse effects on lakeside aesthetic values. As indicated by the stochastic analysis of lake levels in Table 16, enhanced upper basin storage would have little effect on lake levels relative to the without-project condition. Consequently, enhanced upper basin storage is expected to have neutral effects on aesthetic values relative to the No Overflow without-project condition.

- **Recreation:** Further rise of Devils Lake would be expected to improve recreation resources on Devils Lake but could also create further difficulties in providing recreation access. Enhanced upper basin storage would have little effect on lake levels or overflow potential relative to the without-project condition. As a result, enhanced upper basin storage is expected to have neutral recreation effects relative to the No Overflow without-project condition.

- **Community Growth/Development:** Further rise of Devils Lake would have significant negative effects on community growth/development of lakeside communities. Enhanced upper basin storage would produce modest reduction in the rate and extent of lake level rise (see Table 16). Consequently, upper basin storage is expected to have neutral effects relative to the No Overflow condition.

- **Community Cohesion:** During further rise of the lake, lakeside communities would conflict with downstream communities. Some residents of downstream communities would continue their calls for enhanced upper basin storage; lakeside communities would renew their support for an outlet. Implementation of enhanced upper basin storage would please downstream supporters and would dismay outlet proponents. The relatively poor hydrologic performance of upper basin storage (see Table 17) would dismay lakeside residents when the lake continues to rise, and scarce funds have been expended on enhanced upper basin storage, rather than an outlet. As a result, it is expected that enhanced upper basin storage would result in substantial negative effects on community cohesion relative to the No Overflow condition.

- **Land Use/Productivity:** Additional rise of Devils Lake would have significant negative effects on land use/productivity by inundating lakeside lands. The ineffectiveness of enhanced upper basin storage in controlling lake levels (see Table 16) would limit positive land use effects of this alternative. Consequently, enhanced upper basin storage is expected to have neutral effects on land use/long-term productivity.

- **Controversy:** Additional rise of Devils Lake would inflame controversy about the most appropriate solution for this problem. Under the without-project condition, lakeside residents would perceive the inaction negatively and blame the individuals or groups perceived to be responsible. Implementation of enhanced upper basin storage would please many downstream residents but would dismay lakeside residents who perceive an outlet as the best solution to Devils Lake flooding problems. As indicated in Table 16, enhanced upper basin storage would have little effect on Devils Lake levels. If the lake rises, there would be more controversy about the most appropriate solution for this problem. The relatively poor hydrologic performance of enhanced upper basin storage and resultant ineffectiveness in controlling lake levels would stimulate additional controversy as lakeside residents perceive this alternative as a lost opportunity to build an outlet. Consequently, enhanced upper basin storage would result in substantial negative impacts on controversy regarding Devils Lake relative to the Overflow condition.

LOCAL ECONOMIC EFFECTS

- **Environmental Justice – Economic:** Most of the structures on the Fort Totten Indian Reservation at risk from higher lake levels have been relocated to high ground. Elsewhere in Benson County there are some structures at risk from rising lake levels. Given the high poverty rate in this county, some of these structures may house low-income residents. Rising lake levels could inundate some of these structures, as well as pasture land on the reservation. As indicated in Table 16, enhanced upper basin storage is expected to have modest impact on lake levels. Implementation of the outlet would not have adverse effects on low-income populations. Consequently, it is anticipated that enhanced upper basin storage would have neutral effects in terms of environmental justice (economic) relative to the No Overflow condition.

- **Transportation:** Additional rise of Devils Lake would have significant negative effects on transportation around the lake primarily due to construction to raise roads threatened with inundation. Enhanced upper basin storage would have little effect on lake levels (see Table 16). Consequently, the outlet is expected to have neutral effects on transportation relative to the No Overflow condition.

- **Agriculture:** The No Overflow conditions are expected to have significant negative effects on agriculture due to inundation of croplands and pasture with further lake rise. Upper basin storage would have some minor positive effects by controlling lake levels to some degree, but the trade-off for agriculture would be cropland and pasture taken out of production. Consequently, it is expected that upper basin storage would have minor negative effects on agriculture relative to the No Overflow condition.

- **Energy Resources/Use: E**nhanced upper basin storage is not expected to affect energy resources/use in the study area relative to the No Overflow condition.

- **Employment:** Employment in lakeside counties appears to be largely unaffected by the rise of Devils Lake in recent years. Further rise of Devils Lake may at some point affect employment in the Devils Lake area by taking agricultural land out of production. Enhanced upper basin storage would have little effect on lake levels of Devils Lake. Although construction of the storage impoundments could provide some employment for the region, this alternative would remove some land from productive agricultural use. In sum, enhanced upper basin storage is expected to have no effect on employment relative to the No Overflow condition.

- **Regional Growth:** Further rise of Devils Lake would be expected to have substantial negative effects on regional growth due to inundation of farmland, disruption of regional shopping patterns, and difficulty in attracting new enterprises to the area. Although enhanced upper basin storage would have little effect on rising lake levels, the expenditure of construction funds in the area would provide some economic stimulus. The action to solve this regional problem would provide a psychological boost to the region perhaps inducing new investment, and the expenditure of construction funds in the area would provide some economic stimulus. However, enhanced upper basin storage could diminish economic prospects through dashed expectations of the chosen solution to the Devils Lake problem. As a result, enhanced upper basin storage is expected to have minor negative effects on regional growth relative to the No Overflow condition.

- **Business Activity:** Additional lake level rise could have adverse effects on business activity in the Devils Lake area. Additional rise of Devils Lake would exacerbate disruptions of business activity observed in recent years. In particular, regional shopping changes appear to have been at least temporarily altered by transportation impacts of the rising lake. Since enhanced upper basin storage would do little to control lake levels (see Table 16), this alternative would have little direct effect on business activity. However, as with the above discussion of regional growth, the action to solve this regional problem could result in a psychological letdown to the Devils Lake region through false expectations of the efficacy of this alternative. Nevertheless, expenditure of construction funds in the area would provide some economic stimulus. In sum, enhanced upper basin storage is expected to have minor negative effects on business activity relative to the No Overflow condition.

- **Property Values:** Further lake rise would have mixed effects on property values around the lake. Since enhanced upper basin storage would have little effect on levels of Devils Lake, this alternative would have neutral effects on property values.

- **Fiscal Effects:** Additional rise of Devils Lake would have adverse fiscal effects on local governments around the lake. Higher lake levels would result in decreased tax revenues to and increased expenditures by local governments. Upper basin storage would have neutral effects commensurate with its effect on lake levels.

- **Public Facilities/Services:** Further rise of Devils Lake would have negative effects on public facilities/services by necessitating additional modification of stormwater and wastewater systems around the lake. Due to the modest impact on lake levels (see Table 16), it is expected that expanded upper basin storage would have neutral effects on public facilities/services relative to the No Overflow condition.

Table 39
Assessment of Net Impacts
With-Project Condition: Expanded Infrastructure Measures
Without-Project Condition: Overflow

Social & Economic Evaluation Criteria	Magnitude of Anticipated Impact (–) ◄——► (+)						
	Adverse Effects			No Effect	Positive Effects		
	Significant	Substantial	Minor		Minor	Substantial	Significant
Social Effects							
Population Relocation					✓		
Environmental Justice - Social					✓		
Public Health					✓		
Public Safety							✓
Noise levels			✓				
Aesthetic Values				✓			
Recreation				✓			
Community Growth/Development					✓		
Community Cohesion		✓					
Land Use/Productivity				✓			
Controversy		✓					
Local Economic Effects							
Environmental Justice - Economic					✓		
Transportation							✓
Agriculture				✓			
Energy Resources/Use				✓			
Employment				✓			
Regional Growth				✓			
Business Activity					✓		
Property Values				✓			
Fiscal Effects				✓			
Public Facilities/Services				✓			

With Project Condition: Expanded Infrastructure Measures Without-Project Condition: Overflow

The following discussions explain scores assigned in Table 39, which compares expanded infrastructure measures to the Overflow without-project condition over the 50-year period of analysis.

SOCIAL EFFECTS

- **Population Relocation:** Expanded infrastructure would be expected to have minor positive effects in terms of population relocation relative to the Overflow condition. The installation of new levees landward of the roads-as-levees would provide protection to a relatively small area that is currently protected by the roads-as-levees and would be inundated (perhaps catastrophically) by high lake levels associated with the Overflow condition. Potential positive effects are limited by the relatively small number of people affected by this alternative.

- **Environmental Justice – Social:** High lake levels associated with the Overflow condition would require expanded infrastructure measures in order to allow additional road raisings around Devils Lake. In general, expanded infrastructure would have mixed effects on the Spirit Lake reservation. Lands would be inundated between the roads-as-levees and the new levees to be located on their landward sides. The new levees would protect a small number of Native Americans from potential failure of the roads-as-levees, and the levees would allow continued transportation access if the lake continues to rise. However, some Reservation lands would be inundated with implementation of this alternative (between the roads and the landward levees) in order to equalize hydraulic pressure on the road embankments. Given the very high lake levels associated with the Overflow condition, expanded infrastructure measures are anticipated to have minor positive effects on minority populations. Potential positive effects are limited by the relatively small number of people affected by this alternative.

- **Public Health:** The expanded infrastructure alternative would have minor positive effects on the mental health of residents who are currently exposed or potentially exposed with higher lake levels (via the Overflow condition) to catastrophic failure of the roads-as-levees. Potential positive effects are limited by the relatively small number of people involved with this alternative.

- **Public Safety:** Expanded infrastructure could have a significant positive effect on public safety relative to the Overflow condition. The new levees would significantly reduce risk of catastrophic failure of the roads-as-levees. They would also reduce risks for motorists traveling along these roads.

- **Noise Levels:** Expanded infrastructure would have minor negative noise effects relative to the Overflow condition associated with levee construction. These effects would be temporary and limited by the rural location.

- **Aesthetic Values:** Expanded infrastructure would not affect aesthetic values around Devils Lake relative to the Overflow condition. The lakeside areas affected by this alternative are relatively small.

- **Recreation:** Expanded infrastructure would not affect recreation resources around Devils Lake relative to the Overflow condition.

- **Community Growth/Development:** Expanded infrastructure would be expected to have minor positive effects on growth/development of lakeside communities, particularly St. Michaels in Benson County. Potential positive effects are limited by the relatively small number of people affected by this alternative.

- **Community Cohesion:** Expanded infrastructure would not be expected to directly impact community cohesion around Devils Lake relative to the Overflow condition. However, pursuit of this alternative instead of an outlet or upper basin storage would increase conflict between lakeside communities, which support an outlet, and downstream communities along the Sheyenne River, which favor upper basin storage. Both groups could perceive expanded infrastructure as a distraction of time, scarce funds, and attention. Under the Overflow condition, there would be significant pressure from both sides to control lake levels and reduce overflow potential. Consequently, expanded infrastructure is expected to have substantial negative effects on community cohesion relative to the Overflow condition.

- **Land Use/Productivity:** Expanded infrastructure would not affect land use/productivity around Devils Lake relative to the Overflow condition.

- **Controversy:** For the same reasons discussed above under community cohesion, expanded infrastructure could have a substantial adverse effect on controversy surrounding Devils Lake relative to the Overflow condition.

LOCAL ECONOMIC EFFECTS

- **Environmental Justice – Economic:** As discussed above under environmental justice (social), very high lake levels under the Overflow condition would require expanded infrastructure measures in order to allow additional road raisings. The new levees would potentially protect a small number of economically disadvantaged residents from potential failure of the roads-as-levees, and the levees would allow continued transportation access if the lake continues to rise. However, some lands would be inundated with implementation of this alternative (between the roads and the landward levees) in order to equalize hydraulic pressure on the road embankments. Given the very high lake levels under the Overflow condition, expanded infrastructure measures would have minor positive effects. Potential positive effects are limited by the relatively small number of people affected by this alternative.

- **Transportation:** Expanded infrastructure measures would have significant positive effects on transportation relative to the Overflow condition. The levees would allow additional road raisings in response to very high lake levels (of the Overflow condition) and would reduce safety hazards for motorists traveling these roads.

- **Agriculture:** Expanded infrastructure measures would not affect agriculture in the study area relative to the Overflow condition.

- **Energy Resources/Use:** Expanded infrastructure measures would not affect energy resources/use relative to the Overflow condition.

- **Employment:** Expanded infrastructure measures would not affect employment relative to the Overflow condition. The construction-related spending and employment would be modest.

- **Regional Growth:** Expanded infrastructure measures would not affect regional growth relative to the Overflow condition. Construction-related spending as an economic stimulus would be negligible.

- **Business Activity:** Expanded infrastructure measures may have a minor positive effect on business activity relative to the overflow condition by maintaining transportation access from the area south of Devils Lake to the retail sector in the City of Devils Lake.

- **Property Values:** Expanded infrastructure measures would not affect property values relative to the Overflow condition.

- **Fiscal Effects:** Expanded infrastructure measures would not have fiscal effects relative to the Overflow condition.

- **Public Facilities/Services:** Expanded infrastructure measures would not affect public facilities/services relative to the Overflow condition.

Table 40
Assessment of Net Impacts

Without-Project Condition: No Overflow

Social & Economic Evaluation Criteria	Magnitude of Anticipated Impact (–) ◄——► (+)					
	Adverse Effects		No Effect	Positive Effects		
	Significant	Minor		Minor	Substantial	Significant
Social Effects						
Population Relocation				✓		
Environmental Justice - Social				✓		
Public Health				✓		
Public Safety						✓
Noise levels		✓				
Aesthetic Values			✓			
Recreation			✓			
Community Growth/Development				✓		
Community Cohesion		✓				
Land Use/Productivity			✓			
Controversy		✓				
Local Economic Effects						
Environmental Justice - Economic				✓		
Transportation						✓
Agriculture			✓			
Energy Resources/Use			✓			
Employment			✓			
Regional Growth			✓			
Business Activity				✓		
Property Values			✓			
Fiscal Effects			✓			
Public Facilities/Services			✓			

With Project Condition: Expanded Infrastructure Measures Without-Project Condition: No Overflow

The following discussions explain scores assigned in Table 40, which compares expanded infrastructure measures to the No Overflow without-project condition over the 50-year period of analysis.

SOCIAL EFFECTS

- **Population Relocation:** Expanded infrastructure would be expected to have minor positive effects in terms of population relocation relative to the No Overflow condition. The installation of new levees landward of the roads-as-levees would provide protection to a relatively small area that is currently protected by the roads-as-levees and would be inundated (perhaps catastrophically) by high lake levels associated with the No Overflow condition. Potential positive effects are limited by the relatively small number of people affected by this alternative.

- **Environmental Justice – Social:** High lake levels associated with the No Overflow condition would require expanded infrastructure measures in order to allow additional road raisings around Devils Lake. In general, expanded infrastructure would have mixed effects on the Fort Totten Indian Reservation via inundated lands between the roads-as-levees and new levees on their landward sides. The new levees would protect a small number of Native Americans from potential failure of the roads-as-levees, and they would allow continued transportation access if the lake continues to rise. However, some reservation lands would be inundated with implementation of this alternative (between the roads and the landward levees) in order to equalize hydraulic pressure on the road embankments. Given the very high lake levels associated with the No Overflow condition, expanded infrastructure measures are anticipated to have minor positive effects. Potential positive effects are limited by the relatively small number of people affected by this alternative.

- **Public Health:** The expanded infrastructure alternative could have minor positive effects on the mental health of residents who are currently exposed or potentially exposed with higher lake levels (via the No Overflow condition) to catastrophic failure of the roads-as-levees. Potential positive effects are limited by the relatively small number of people involved with this alternative, and the net effect is expected to be negligible.

- **Public Safety:** Expanded infrastructure could have a significant positive effect on public safety relative to the No Overflow condition. The new levees would significantly reduce risk of catastrophic failure of the roads-as-levees. They would also reduce risks for motorists traveling along these roads.

- **Noise Levels:** Expanded infrastructure would have minor negative effects relative to the No Overflow condition associated with levee construction. These effects would be temporary and limited by the rural location.

- **Aesthetic Values:** Expanded infrastructure would not affect aesthetic values around Devils Lake relative to the No Overflow condition. The lakeside areas affected by this alternative are relatively small.

- **Recreation:** Expanded infrastructure would not affect recreation resources around Devils Lake relative to the No Overflow condition.

- **Community Growth/Development:** Expanded infrastructure would be expected to have minor positive effects on growth/development of lakeside communities, particularly St. Michaels in Benson County. Potential positive effects are limited by the relatively small number of people involved with this alternative.

- **Community Cohesion:** Expanded infrastructure would not be expected to directly impact community cohesion around Devils Lake relative to the No Overflow condition. However, pursuit of this alternative instead of an outlet or upper basin storage would increase conflict between lakeside communities, which support an outlet, and downstream communities along the Sheyenne River, which favor upper basin storage. Both groups could perceive expanded infrastructure as a distraction of time, scarce funds, and attention. Under the No Overflow condition, there would be significant pressure from both sides to control lake levels and reduce overflow potential. Consequently, expanded infrastructure is expected to have substantial negative effects on community cohesion relative to the No Overflow condition.

- **Land Use/Productivity:** Expanded infrastructure would not affect land use/productivity around Devils Lake relative to the No Overflow condition.

- **Controversy:** For the same reasons discussed above under community cohesion, expanded infrastructure could have a substantial adverse effect on controversy surrounding Devils Lake relative to the No Overflow condition.

LOCAL ECONOMIC EFFECTS

- **Environmental Justice – Economic:** As discussed above under environmental justice (social), very high lake levels under No Overflow condition would require expanded infrastructure measures in order to allow additional road raisings. The new levees would potentially protect a small number of economically disadvantaged residents from potential failure of the roads-as-levees, and the levees would allow continued transportation access if the lake continues to rise. However, some lands would be inundated with implementation of this alternative (between the roads and the landward levees) in order to equalize hydraulic pressure on the road embankments. Given the very high lake levels under the No Overflow condition, expanded infrastructure measures would have minor positive effects. Potential positive effects are limited by the relatively small number of people affected by this alternative.

- **Transportation:** Expanded infrastructure measures would have substantial positive effects on transportation relative to the No Overflow condition. They would allow additional road raisings in response to very high lake levels (of the No Overflow condition) and would reduce safety hazards for motorists traveling these roads.

- **Agriculture:** Expanded infrastructure measures would not have affect agriculture relative to the No Overflow condition.

- **Energy Resources/Use:** Expanded infrastructure measures would not affect energy resources/use relative to the No Overflow condition.

- **Employment:** Expanded infrastructure measures would not affect employment relative to the No Overflow condition. The construction-related spending and employment would be modest and temporary.

- **Regional Growth:** Expanded infrastructure measures would not affect regional growth relative to the No Overflow condition. Construction-related spending as an economic stimulus would be negligible.

- **Business Activity:** Expanded infrastructure measures may have a minor positive effect on business activity relative to the No Overflow condition by maintaining transportation access from the area south of Devils Lake to retail sector in the City of Devils Lake.

- **Property Values:** Expanded infrastructure measures would not affect property values relative to the No Overflow condition.

- **Fiscal Effects:** Expanded infrastructure measures would not affect property values relative to the No Overflow condition.

- **Public Facilities/Services:** Expanded infrastructure measures would not affect public facilities/services relative to the No Overflow condition.

INTERPRETATION OF TABULATED SCORES

Comparison of the above summary matrices and supporting text suggests that the Pelican Lake outlet is preferable to enhanced upper basin storage and expanded infrastructure measures. If the scores in the matrices are quantified using a range from +3 (significantly positive) to –3 (significantly negative), the Pelican Lake outlet has an average score of 1.8 and 1.4 relative to the Overflow and No Overflow conditions, respectively. This translates into a minor/substantial positive average score for the social and local economic criteria. Enhanced upper basin storage and expanded infrastructure measures scored -0.4 and -0.3 (neutral/negative) and 0.3 and 0.3 (neutral/positive), respectively. Although the matrices were not designed for detailed quantified analysis, the averages support what the reader's eye would discern, that the Pelican Lake outlet is preferable to the other alternatives from the perspective of social and local economic effects. This is based on the relative ability of the alternative plans to inhibit further rise of Devils Lake and prevent an uncontrolled overflow event.

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